



# Eraring

A technical and social history

Ken Thornton

2025



# Eraring



**A technical and social history**

**1982–2025**

**Ken Thornton**

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National Library of Australia Cataloguing-in-Publication entry

Creator: Thornton, Ken, author.

Title: Eraring: A Technical and Social History 1982-2025/ Ken Thornton.

ISBN: 978-0-646-71003-7

Subjects: Eraring Power Station—History.

Electric power plants—New South Wales—Eraring—History.

Coal-fired power plants—New South Wales—Eraring—History.

Eraring (NSW)—History.

Cover: *Turbine Floor, June 2024 (Ken Thornton)*

Title page: *Eraring across Inlet Canal, May 1984*  
(ECNSW- CN70.0216)

### **Questions From a Worker Who Reads**

Who built Thebes of the seven gates?  
 In the books you will find the names of kings.  
 Did the kings haul up the lumps of rock?  
 And Babylon, many times demolished  
 Who raised it up so many times?

In what houses of gold glittering Lima did the builders live?  
 Where, the evening that the Wall of China was finished  
 Did the masons go?  
 Successful Rome is full of triumphal arches.  
 Who erected them?

The young Alexander conquered India.  
 Was he alone?  
 Caesar beat the Gauls.  
 Did he not have even a cook with him?

Philip of Spain wept when his armada  
 Went down. Was he the only one to weep?  
 Frederick the Second won the Seven Year's War.  
 Who else won it?

Every page a victory.  
 Who cooked the feast for the victors?

Bertolt Brecht, 1935

## Contents

|                                                                            |           |
|----------------------------------------------------------------------------|-----------|
| <b>Foreword .....</b>                                                      | <b>11</b> |
| GERRY GROVE-WHITE.....                                                     | 11        |
| STEVEN RIGBY .....                                                         | 12        |
| JIM DAVIES .....                                                           | 14        |
| <b>Chapter 1 Executive Summary .....</b>                                   | <b>19</b> |
| <b>Chapter 2 Introduction.....</b>                                         | <b>23</b> |
| THE NIGHT SHIFT .....                                                      | 23        |
| OUTSIDE AND INSIDE.....                                                    | 24        |
| LOCATION .....                                                             | 36        |
| THE COUNTRY OF THE AWABAKAL PEOPLE .....                                   | 37        |
| BEFORE A POWER STATION WAS EVEN THOUGHT OF .....                           | 39        |
| THE EARLY DAYS .....                                                       | 41        |
| <b>Chapter 3 The Development of Power Stations in New South Wales.....</b> | <b>45</b> |
| THE 1950S: POST-WAR EXPANSION AND HYDROELECTRIC DEVELOPMENT .....          | 47        |
| 1960S-1970S: COAL DOMINANCE AND THE RISE OF CENTRALISED GENERATION .....   | 47        |
| 1980S: DIVERSIFICATION AND ENVIRONMENTAL CONSIDERATIONS .....              | 47        |
| 1990S: MARKET LIBERALIZATION AND THE LEAD-UP TO PRIVATIZATION.....         | 47        |
| ELECTRICITY GENERATION INDUSTRY POST-2000 .....                            | 48        |
| REGULATORY CHANGES .....                                                   | 48        |
| PRIVATISATION AND MARKET REFORM.....                                       | 48        |
| RISE OF RENEWABLE ENERGY.....                                              | 48        |
| COAL AND GAS .....                                                         | 48        |
| TECHNOLOGICAL ADVANCES AND CHALLENGES.....                                 | 48        |
| LOOKING FORWARD.....                                                       | 49        |
| THE CORPORATE ROAD TO ERARING .....                                        | 51        |
| ERARING, A SIXTH-GENERATION POWER STATION.....                             | 51        |
| <b>Chapter 4 The Development of Eraring Power Station.....</b>             | <b>57</b> |
| UNIT #1 WENT TO 700 MW 31 DAYS AFTER SYNCHRONISATION. ....                 | 58        |
| DESIGN .....                                                               | 59        |
| <i>Projects-Construction</i> .....                                         | 59        |
| <i>Generation Group</i> .....                                              | 59        |
| <i>Contractors</i> .....                                                   | 60        |
| <i>Programs</i> .....                                                      | 60        |
| <i>Commissioning Supervision and Coordination</i> .....                    | 60        |
| <i>Pre-Synchronising Commissioning History</i> .....                       | 61        |
| <b>Chapter 5 Technological Evolution .....</b>                             | <b>71</b> |
| GENERAL DESCRIPTION .....                                                  | 71        |
| COAL HANDLING PLANT .....                                                  | 72        |
| BOILER OPERATIONS .....                                                    | 75        |
| AIR HEATERS .....                                                          | 75        |
| BALL MILLS.....                                                            | 77        |
| FABRIC FILTERS .....                                                       | 79        |
| ASH AND DUST.....                                                          | 80        |
| TURBOGENERATOR AND TURBINE .....                                           | 80        |

|                                                                       |            |
|-----------------------------------------------------------------------|------------|
| <i>Turbine Bypass System</i> .....                                    | 80         |
| COOLING WATER SYSTEM .....                                            | 82         |
| <i>Taprogee – online condenser tube cleaning</i> .....                | 85         |
| <i>Fresh Water</i> .....                                              | 85         |
| ELECTRICAL SYSTEMS .....                                              | 86         |
| <b>Chapter 6 Operational Performance</b> .....                        | <b>89</b>  |
| THE STATISTICS.....                                                   | 89         |
| TRADING ELECTRICITY: A HISTORICAL PERSPECTIVE .....                   | 94         |
| PROCESSES AND PROCEDURES THAT MADE A DIFFERENCE.....                  | 97         |
| <i>Unit Starts</i> .....                                              | 97         |
| <i>Thermal Stress</i> .....                                           | 97         |
| <i>The Classification of Unit Startups</i> .....                      | 98         |
| <i>Job Sheets and Operational Efficiency</i> .....                    | 98         |
| <i>Operator Duties: Then and Now</i> .....                            | 99         |
| <i>Operator Inspections: How DORIS 'Helps' APPOs in 2023</i> .....    | 102        |
| <i>Information Management: A Little-Known Aspect of Eraring</i> ..... | 106        |
| MAINTENANCE STRATEGY .....                                            | 108        |
| <i>Asset Condition Assessment</i> .....                               | 108        |
| <i>Preventive Maintenance</i> .....                                   | 108        |
| <i>Predictive Maintenance</i> .....                                   | 108        |
| <i>Planned Shutdowns and Overhauls</i> .....                          | 109        |
| <i>Maintenance, Upgrades, and Asset Management</i> .....              | 109        |
| <i>Unit Outage – late 2023</i> .....                                  | 110        |
| <b>Chapter 7 Operational Milestones:</b> .....                        | <b>117</b> |
| ERARING OPEN-CUT MINE .....                                           | 117        |
| OFFICIAL OPENING OF THE STATION .....                                 | 121        |
| WORLD RECORD .....                                                    | 123        |
| 720 MW UPGRADE .....                                                  | 125        |
| <i>Overview of the Upgrade</i> .....                                  | 125        |
| <i>Strategic Significance</i> .....                                   | 126        |
| <b>Chapter 8 Ownership</b> .....                                      | <b>129</b> |
| NSW STATE GOVERNMENT .....                                            | 129        |
| <i>Electricity Commission of New South Wales</i> .....                | 129        |
| <i>Pacific Power</i> .....                                            | 131        |
| <i>Eraring Energy</i> .....                                           | 134        |
| ORIGIN ENERGY .....                                                   | 135        |
| <b>Chapter 9 People at Eraring</b> .....                              | <b>137</b> |
| JOURNEYS THROUGH ERARING: ATTRACTION AND LEGACY .....                 | 137        |
| WHY DID PEOPLE CHOOSE ERARING .....                                   | 137        |
| TENURE: LIFETIMES OF DEDICATION .....                                 | 138        |
| WHY PEOPLE LEFT.....                                                  | 138        |
| LIFE AFTER ERARING .....                                              | 139        |
| MEMORIES THAT DEFINE ERARING .....                                    | 139        |
| REFLECTIONS ON ERARING .....                                          | 140        |
| ARE YOU A 'POWER STATION TRAGIC'? .....                               | 141        |
| CELEBRATIONS.....                                                     | 143        |
| FICTION BASED ON FACTS. ....                                          | 144        |

|                                                                                                                        |            |
|------------------------------------------------------------------------------------------------------------------------|------------|
| GERRY GROVE-WHITE: A PIONEER IN SAFETY AND TRANSFORMATION AT ERARING ENERGY.....                                       | 147        |
| MY DAD.....                                                                                                            | 148        |
| PEOPLE AT ERARING – MAY 2023 .....                                                                                     | 153        |
| A \$1.6 BILLION TOY TO PLAY WITH (KEN THORNTON) .....                                                                  | 153        |
| TRAINING AND SKILL DEVELOPMENT: .....                                                                                  | 156        |
| <i>Operator Training</i> .....                                                                                         | 156        |
| <i>Electricity Commission</i> .....                                                                                    | 156        |
| <i>Eraring</i> .....                                                                                                   | 156        |
| <b>Chapter 10 Regulatory and Environmental .....</b>                                                                   | <b>159</b> |
| <i>Safety at Eraring: A Journey of Transformation</i> .....                                                            | 159        |
| <i>Origin Continues the Safety Legacy</i> .....                                                                        | 160        |
| <i>Power Station and High Voltage Safety Rules, Access to Apparatus Rules, Generation Safe Access Procedures</i> ..... | 161        |
| <i>Origin</i> .....                                                                                                    | 163        |
| <i>Incidents</i> .....                                                                                                 | 165        |
| <i>Environmental Stewardship and Sustainability:</i> .....                                                             | 167        |
| <b>Chapter 11 Community Engagement and Social Impact .....</b>                                                         | <b>171</b> |
| <i>Community Impact</i> .....                                                                                          | 171        |
| <i>Public Perception</i> .....                                                                                         | 171        |
| <i>Corporate Social Responsibility</i> .....                                                                           | 171        |
| <i>Education and Awareness</i> .....                                                                                   | 171        |
| <i>Collaboration and Partnerships</i> .....                                                                            | 171        |
| <i>The Social Fabric and Community Relations</i> .....                                                                 | 171        |
| <i>Eraring and the Energy Transition</i> .....                                                                         | 174        |
| <i>Selling Eraring</i> .....                                                                                           | 175        |
| <i>Eraring 2025 and Closure</i> .....                                                                                  | 179        |
| <i>Eraring 2027 and Closure</i> .....                                                                                  | 180        |
| YALLOURN E AND HAZELWOOD.....                                                                                          | 182        |
| <i>Yallourn E</i> .....                                                                                                | 182        |
| <i>The Hazelwood Song</i> .....                                                                                        | 182        |
| <b>Chapter 12 Eraring’s Role in the Energy Transition .....</b>                                                        | <b>185</b> |
| REPLACING ERARING’S OUTPUT .....                                                                                       | 185        |
| BALANCING SUPPLY AND DEMAND.....                                                                                       | 185        |
| ERARING BATTERY ENERGY STORAGE SYSTEM (BESS) .....                                                                     | 185        |
| COLLABORATION WITH ALLEGRO ENERGY .....                                                                                | 185        |
| <b>Chapter 13 Conclusion: A Heritage in Engineering and Human Stories .....</b>                                        | <b>186</b> |
| CLOSING THOUGHTS: A JOURNEY'S END .....                                                                                | 187        |
| ACKNOWLEDGEMENTS .....                                                                                                 | 189        |
| RESEARCH PARTICIPANTS .....                                                                                            | 191        |
| NAME INDEX .....                                                                                                       | 193        |
| GLOSSARY.....                                                                                                          | 193        |
| LIST OF FIGURES.....                                                                                                   | 194        |
| REFERENCES.....                                                                                                        | 197        |



*Figure 1 Transformer Bay, March 1982*  
(ECNSW 1350)



*Figure 2 From the south-east, 2007*  
(Ken Thornton)



*Figure 3 Units 3 & 4 under construction between November 1982 and July 1983  
(ECNSW CT7.0011)*



*Figure 4 A few of the thousands who have, and continue to work at Eraring, July 2023  
Steve Gambrill, Brad Cameron, Dave Tod, Ash Baweja, Ross Shirtley, Dave Williams, Steve Wheeler,  
Keith McBurney, Ian Dawson.  
(Ken Thornton)*

## FOREWORD

### Gerry Grove-White

Managing Director of Eraring Energy (January 2001 – August 2005)



*Figure 5 Gerry Grove-White*

I began my tenure as Managing Director of the newly corporatised Eraring Energy on January 2, 2001. This company emerged from the remnants of Pacific Power, with its asset base comprising hydroelectric facilities, including the Kangaroo Valley Pumped Storage Scheme and the Hume Power Station. However, the company's actual "beating heart" was the Eraring Power Station, located on the shores of Lake Macquarie.

At the time, the company had inherited Pacific Power's derivative contracts, many of which were unfavourable and tied to Victorian supplies. Managing these contracts required maximising the availability of Eraring Power

Station. These challenges were communicated to staff across workgroups, who responded with exceptional dedication, delivering high availability and strong performance over the years.

One senior staff member described Eraring as having a world-class safety record. However, a deeper review by the Safety Committee revealed significant room for improvement. This realisation led to adopting a new guiding principle: "Nothing is so important that it can't be done safely." This philosophy inspired a company-wide commitment to improving safety standards, resulting in multiple advancements.

The Safety Committee initiated a thorough review of the plant's isolation systems, uncovering several deficiencies. A working group was formed to benchmark best practices nationwide. Their recommendations led to the implementation of a new, robust isolation procedure across all company sites as a top priority.

Another key initiative was the development of a comprehensive drug and alcohol policy. A staff-led working group identified and implemented the most effective policies and procedures, ensuring the company addressed these risks proactively.

These efforts, along with other safety initiatives, have significantly improved the company's safety performance. In later years, Eraring earned a prestigious national safety award, underscoring the success of these efforts.

The empowerment of staff also fuelled significant operational and organisational improvements. Among these was the replacement and upgrade of plant control systems and operator interfaces—critical steps enabling the plant's capacity increase from 4x660 MW to 4x720 MW. This upgrade made Eraring the largest coal-fired power station in Australia.

As Managing Director, I was privileged to work with a team wholly committed to improving safety and plant performance. Their dedication is a defining highlight of my 45-year career in the power industry.

## Steven Rigby

General Manager, Generation and Energy Transition, Origin Energy (December 2010 – Present)



*Figure 6 Steven Rigby*

I started my proud association with Eraring Power Station and its talented team following Origin's acquisition of the plant from the NSW Government in 2013. At that time, Eraring's 2880 MW almost doubled the generation capacity in Origin's portfolio and was delivering around a quarter of the state's energy, as it does today.

In addition to acquiring a high-quality asset, our acquisition of Eraring also brought a workforce with exceptional expertise to Origin. The dedication, professionalism and unwavering sense of ownership of the plant from everyone I work with at Eraring daily has never failed to impress me.

Eraring has been the backbone of the energy supply in NSW. Origin's continued investment in the plant has seen it continue to deliver exceptional operating and safety performance, particularly considering the plant's age.

One of my Eraring highlights was the once-a-20-year inspection of the site's water inlet and outlet canals. Not only did this allow the site to conduct detailed inspections of the asset infrastructure, but it also utilised its expertise to devise an ingenious environmental solution to relocate tonnes of fish back into the waters of Lake Macquarie from the canal infrastructure.

Another highlight has been the development and building of the Eraring battery, one of the largest battery energy storage systems globally. Constructed in three stages, the combined energy storage of this battery will be 700 MW / 2,800 MWh. Our investment in the Eraring battery will ensure that this site continues to play a vital role in delivering reliable energy for decades to come.

In 2022, Origin notified the Australian Energy Market Operator (AEMO) of the planned retirement of Eraring Power Station (EPS) as early as mid-2025. Following an agreement with the NSW Government, the retirement has been delayed by two more years to August 2027.

As part of our commitment to the Lake Macquarie community, during Eraring's transition to closure, Origin has established a dedicated community investment fund, which will invest \$5 million locally between 2023 and 2032. The fund is just one of the ways Origin plans to support the local community through this transition, supporting initiatives for community wellbeing, community resilience, economic transition and diversification, and environmental protection and outdoor amenities.

We established the Future Directions program to support our Eraring employees through the transition, which provides ongoing, individualised career planning, training, consultation, communication and wellbeing support. The program aims to contribute to the plant's safe and reliable operations, go above and beyond to support individuals to achieve their future career and life choices and act so that our people feel listened to, respected, supported and valued.

I am incredibly proud to be part of Origin and the Eraring team. I'm very grateful for its people's dedication, expertise and efforts, who have all contributed to the plant's 40-plus years of exceptional service.



*Figure 7 Eraring Battery site with the power station in the background.  
(Origin Energy)*

## Jim Davies

Operator and Shift Manager (November 1989 – June 2016)



*Figure 7 Jim Davies*

I started at Eraring in November 1989. I had already spent 18 years in the power industry, including 11 years as an operator at Vales Point A and B.

In late 1988, I was a power plant operator at Vales Point A when the news came that the NSW government had decided to close and decommission Vales A. I was redeployed to Eraring Power Station, often referred to as "The Big E"—the fleet's flagship. Eraring was built by engineers for engineers, and it had a stellar reputation for its engineering excellence and design.

In 1989, along with three colleagues, I made the move to Eraring, where we were introduced to Ken Thornton, affectionately known as 'Kotter.' Ken was responsible for training the first group of operators and led the training for us newcomers. It marked the beginning of what would become 27 years at Eraring, with the final 10 years spent as Shift Manager.

One of the constants during my time at Eraring was change. Over the years, the power industry evolved rapidly, and Eraring was no exception. There was always something new, from corporate restructures to the installation of new plant and equipment. The introduction of the National Electricity Market (NEM), an electronic Permit-to-work system, an isolation lockout system and updates to rules and procedures all shaped the way we worked. Perhaps the most significant change came with the appointment of Gerry Grove-White as the Managing Director of Eraring Energy in 2001. His leadership brought about substantial transformation to the station, as detailed in this history.

Throughout these changes, Eraring remained a dynamic and exciting workplace. There were challenges, certainly, but also countless opportunities for growth and innovation. Eraring had earned a reputation as a close-knit, well-run facility committed to safety.

This history of Eraring is not only a reflection of the plant's achievements but also a testament to the incredible contributions of its employees over the years. What you hold in your hands is a broad insight into the successful impact of Eraring Power Station on the state's power grid and the people who made it all possible.



*Figure 8 From 500 feet  
April 2024 (Ken Thornton)*



*Figure 9 From the north  
(ECNSW)*



*Figure 10 High Voltage Switchyard across the High-Level Canal  
(ECNSW)*



*Figure 11 Welcome to Eraring, 2025  
(Ken Thornton)*

## CHAPTER 1 EXECUTIVE SUMMARY

For more than four decades, Eraring Power Station has been a defining presence on the shores of Lake Macquarie. Built in response to New South Wales' growing energy demands, it symbolised engineering excellence, technological progress, and the people who made it run.

*Eraring: A Technical and Social History (1982–2025)* weaves together the technical story of the plant with the human narratives of those who designed, built, operated, and maintained it.

The book opens with the historical backdrop of power generation in New South Wales, tracing the rise of coal-fired power stations in the fragmented networks of the early 20th century. As electricity demand surged through the postwar years, the newly formed Electricity Commission of NSW embarked on an ambitious program of expansion, culminating in the construction of Eraring, Bayswater, and Mt Piper—sixth-generation power stations designed to be larger, more efficient, and more technologically advanced than their predecessors.

Eraring's story unfolds from the initial site selection and early environmental concerns to the massive construction effort that saw thousands of workers transform an empty site into a state-of-the-art power station. The commissioning process—fraught with technical hurdles, industrial disputes, and moments of triumph—demonstrates the complexity of such an undertaking.

At the heart of Eraring's story are the people who ran it. Operators working day and night shifts, engineers overseeing critical maintenance, and managers making high-stakes decisions in a changing electricity market—all shaped the station's history. This History brings these voices to the forefront, offering an inside look at the culture of Eraring, the pride its workforce felt in their achievements, and the camaraderie that defined life in the power industry.

Yet, as the book clarifies, no power station exists in isolation from broader economic and political forces. Eraring adapted to shifting government policies, from the restructuring of the electricity sector in the 1990s to the challenges of competing in the National Electricity Market and the rise of renewable energy technologies. The station's ownership transitioned from state control through the Electricity Commission to Pacific Power and Eraring Energy, and it was finally privatised with Origin Energy. All reflected the broader transformation of Australia's power industry.

The story takes a decisive turn in the 21st century as renewable energy began to reshape the electricity landscape. While Eraring continued to provide reliable baseload power, growing concerns over carbon emissions, market forces, and government policies signalled a shift away from coal. In 2022, Origin Energy announced plans to close the plant, initially set for 2025 but later extended to 2027. With this decision came new questions: What would replace Eraring's massive generating capacity? How would its workforce transition? What role would the site play in the future of Australia's energy system?

Plans for a large-scale battery storage facility on the site suggest a future where Eraring continues to contribute to energy security, albeit in a different form. The book examines these developments within the broader context of Australia's energy transition, highlighting the technical, economic, and social challenges associated with transitioning from fossil fuels to renewable energy sources.

Ultimately, *Eraring: A Technical and Social History* is more than just the story of a power station—it is a chronicle of change, resilience, and adaptation. It is a testament to the engineers, operators, maintainers and administrators who kept the plant running and a reflection of what happens when an industry reaches the end of an era. As the chimneys that once defined the skyline prepare to fall silent, this history ensures that the legacy of Eraring and its people will not be forgotten.



Figure 12 "I am complaining about Eraring's size increase. Haven't they got any sense of responsibility?"  
 Courtesy Peter Lewis and the Newcastle Herald (about 1999)

This project was supported by Origin Energy.





*Figure 13 At Night, January 2022*  
(Sam Brayley)



*Figure 14 Dusk*  
(ECNSW CT7.0007)

## CHAPTER 2 INTRODUCTION

### The Night Shift

Things are different at night. As darkness falls, the familiar sights and sounds of daily life retreat, leaving behind a world that feels both strange and familiar.

At 3 a.m., the Auxiliary Cooling Towers breathe water vapour into the cold night air. On the walkway, the only sound is the echo of your own footsteps.

At night, activity slows but does not stop.

Electricity demand remains constant around the clock, making continuous generation essential. While New South Wales sleeps, industries keep running, streets stay lit, phones charge, fridges hum, and pool pumps churn away. For thermal power stations like Eraring, this means generation must continue 24 hours a day.

But the power station's life at night is very different from its daytime operations. Walking through the main plant under blinding floodlights at 3 a.m. feels oddly exposed. In the distance, the Cooling Water Pumps loom unseen, their deep hum unheard, the air cooler, the loneliness sharper.

At night, the focus shifts to core production tasks: maintaining output to meet market obligations while keeping safety, security, and environmental concerns at the forefront.

The demand for electricity depends on weather, industry, and both commercial and residential use. The availability of generating plants at Eraring and elsewhere is also crucial.

In earlier years, demand would drop after 9 p.m. and rise again around 6 a.m. as the morning peak developed. But today, with the rise of renewable energy, the pattern has shifted. Daytime loads are often at their lowest, thanks to grid and rooftop solar, while evening loads climb higher. Sometimes, daytime generation is so plentiful that the five-minute spot price even dips into negative territory.

When loads are high, whether day or night, the operators' workload increases. Additional auxiliary systems, such as the PF Mills, are brought online. Vigilance is always required, but at high loads, it intensifies: small problems can quickly escalate. Critical issues must be resolved overnight, while maintenance that can wait is handled by the fully staffed day teams. Night operations focus on safely managing both personnel and the massive assets that are the station itself.

At 2 a.m., a Power Plant Operator (PPO) sips black coffee, rubbing tired eyes as he monitors banks of glowing computer screens. The operating teams work in 12-hour shifts, swapping over at 7 a.m. and 7 p.m. And during months when one or more of the station's four 720 MW units are offline, outage or maintenance work continues right through the night.

The hardest part of running the station overnight isn't technical — it's human. Night work is exhausting. The biggest challenge is keeping everyone focused and aware. Shift Managers check in regularly with their PPOs and Assistant PPOs (APPOs), making sure they're safe, alert, and staying active.

At night, Eraring is a quieter place but never a silent one.

## Outside and inside



*Figure 15 “and on the ....th day, God said,” 2023  
(Peter Lyons)*

Driving south from Toronto, the journey to Eraring unveils a fleeting landscape of towering chimneys. The power station stacks of Eraring and Wangi punctuate the skyline briefly before they're obscured by the dense foliage surrounding Myuna Bay, with its council playground and the deserted entrance of the now-closed Myuna Bay State Recreational Centre. The hidden yet imposing Eraring Ash Dam is just one piece of infrastructure, hinting at the intricate operations that take place behind the scenes.

As we approach Eraring, the landscape shifts to a more industrial setting with each kilometre. Parking spots flank the approach road, where grazing wallabies seem unperturbed by the industrial giant beside them. The southern end of the station is dominated by green and yellow structures — fabric filters and towering stacks, with steam pipes weaving a high-energy tapestry of industry.

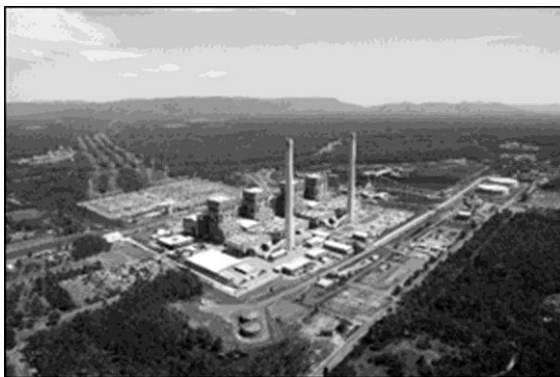


*Figure 16 Aerials, post 1984 and January 1981  
(ECNSW)*

The viewpoint from Eraring's car park is starkly different from Liddell's, offering a more comprehensive glance inside the operational heart of the facility. The administrative building serves as a gateway to the complex, where high-visibility work gear becomes the day's uniform, contrasting sharply with the tones of the machinery and structures around.

From the east, Eraring's enormous scale is undeniably impressive. Its twin 200-meter stacks and the quartet of 70-meter-high boiler structures are not just functional but also monuments to modern energy production. Despite their purpose, the air remains clear, a testament to the effectiveness of the fabric filters at work.

When you exit the lift at the southern end of the Operating Floor, a panorama stretches into the distance. The view is of tiled flooring, massive orange machines, and a steady roar. The first of the four turbine-generators is flooded with natural light from the substantial window-like southern end of the building.



*Figure 17 Unit 1 Turbine-Generator, 2024*  
(Ken Thornton)

On this day in December 2022, material is everywhere - Unit 1 is out of service for overhaul. Top casings of Low-Pressure Turbines are being worked on, suggesting that this outage is significant.

The basement of the boiler is the same: dark, dirty, noisy and, in parts, the floor wet. The rumble is as I remember it from 15 years ago. The dominant colour is the yellow of the Ball Mills shrouding and their motors. This contrasts with the primary air ducts' silver dust-covered aluminium cladding.

The basement of the turbine is the same as I remember it, but this time, it sounds more like a roar. Auxiliary plant items are everywhere, yet the predominant features are large silver steam pipes, much smaller oil pipes, air pipes, and others transporting condensate, feedwater or fire system water.



*Figure 18 Pipework in the basement, February 2023*  
(Ken Thornton)



*Figure 19 Pipework in the basement, February 2023*  
(Ken Thornton)

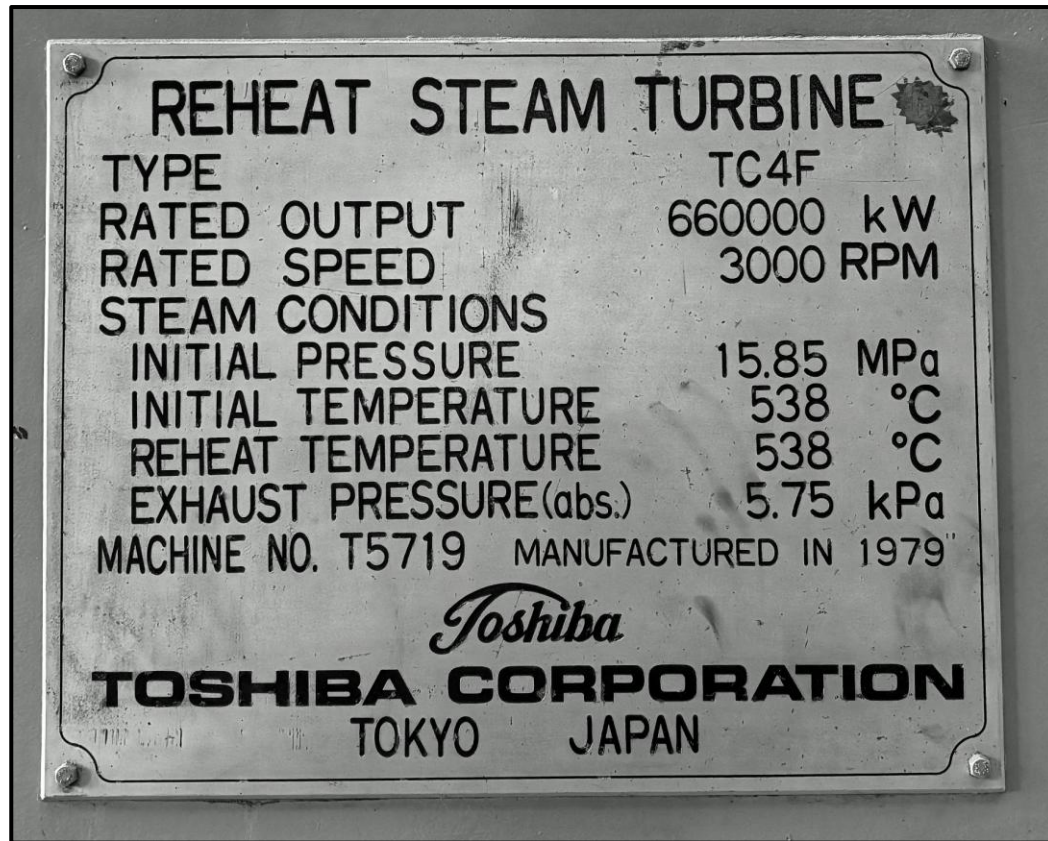


Figure 20 Original 1982 Turbine Nameplate.

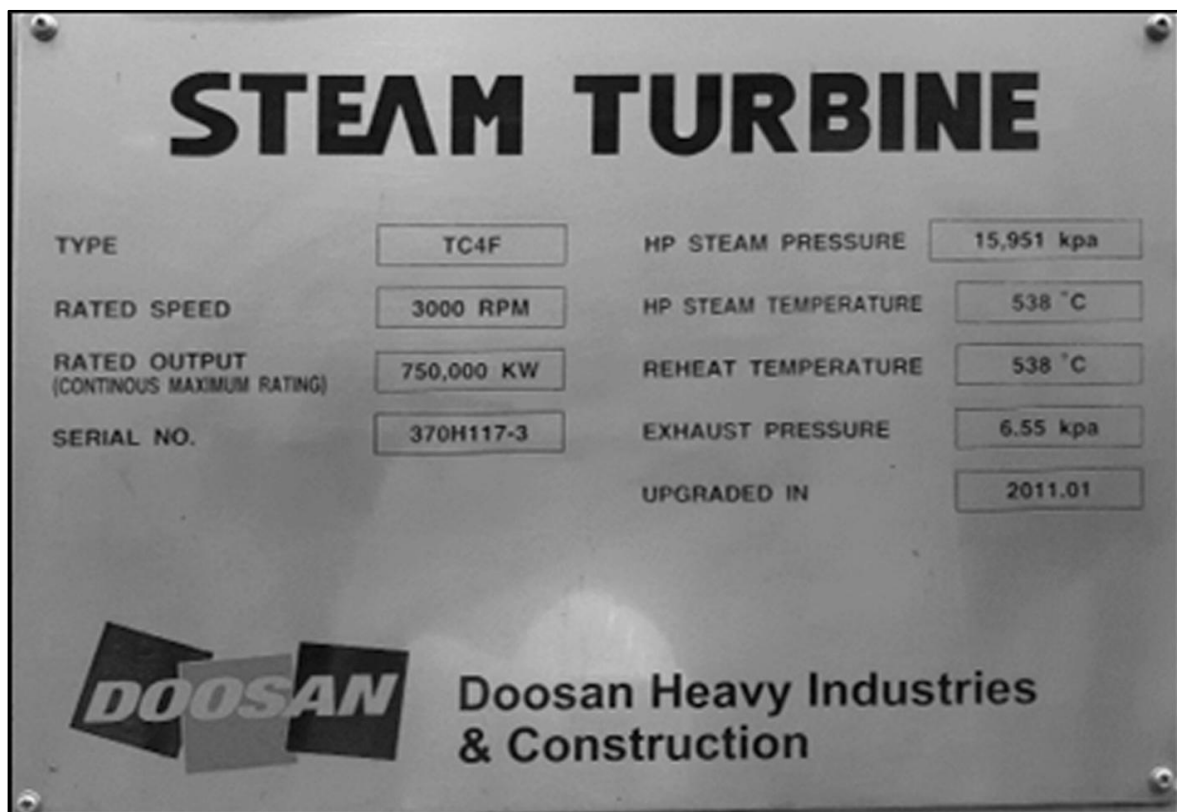


Figure 21 Turbine Nameplate, February 2023



*Figure 22 Low Pressure (LP) Heaters, November 2024  
(Ken Thornton)*

The silver-clad horizontal Low-Pressure Feedwater Heaters are on the operating floor area between the turbine and the boiler. Above them, on an upper mezzanine floor, are the equally silver-clad High-Pressure Feedwater Heaters



*Figure 23 Low-Pressure and High-Pressure Feedwater Heaters, November 2024  
(Ken Thornton)*



*Figure 24 High Pressure (HP) Heaters, November 2024  
(Ken Thornton)*



*Figure 25 Coal Feeders, November 2024  
(Ken Thornton)*

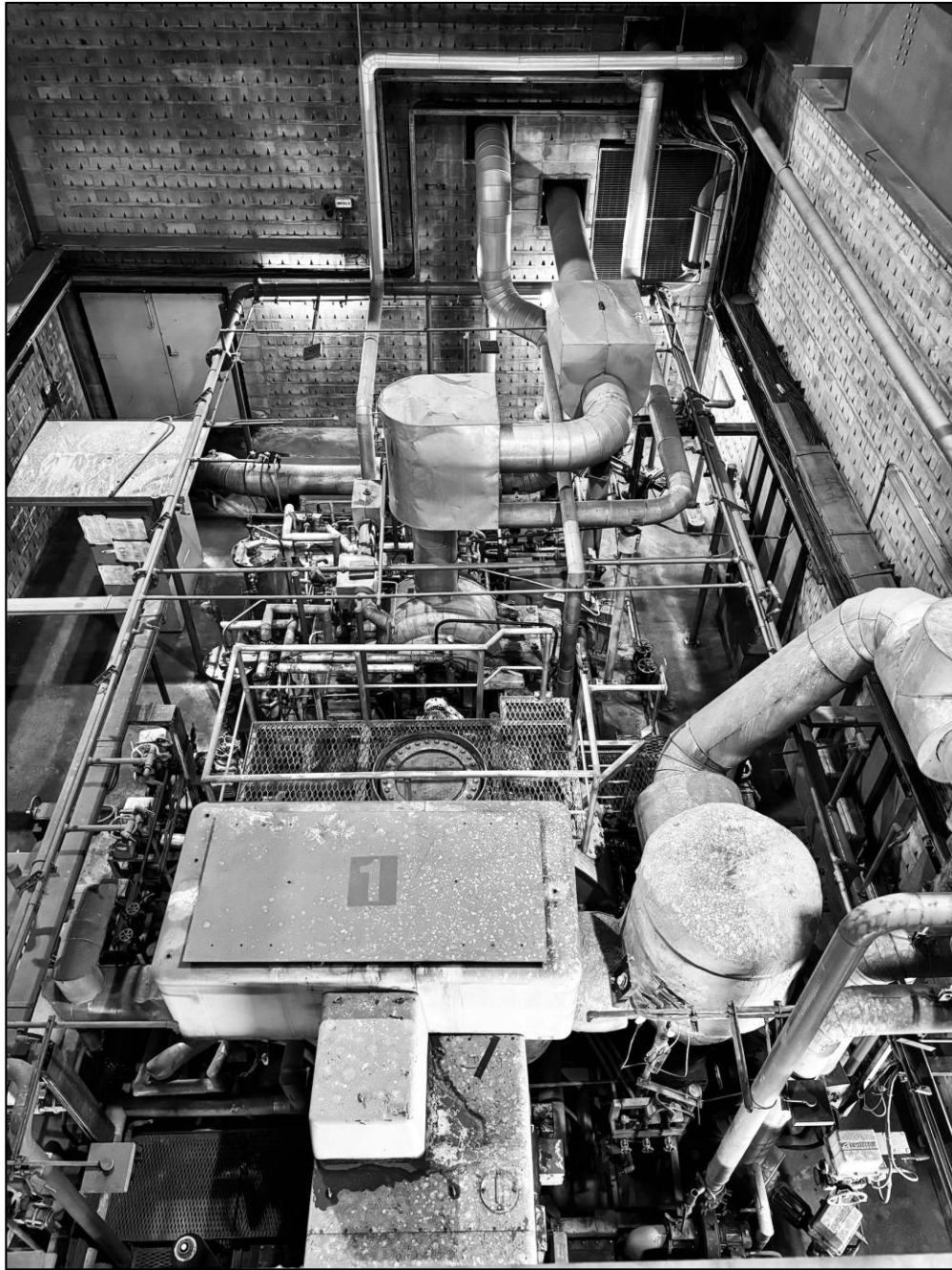


*Figure 26 Steam Feed Pump Turbine, February 2023  
(Ken Thornton)*



*Figure 27 Mezzanine Floor November 2024  
(Ken Thornton)*

The silver steam pipes, red firefighting water piping and Steam Feed Pumps are prominent among a complex mass of pipes, valves, and pumps on the turbine's mezzanine and basement levels.

The basement remains the same: dark, dirty, noisy, and, in parts, the floor is wet. Dust covers the Pulverising Fuel Ball Mills. The dominant colour is the yellow of the Ball Mills shrouding and their motors. This contrasts with the primary air ducts' silver dust-covered aluminium cladding.

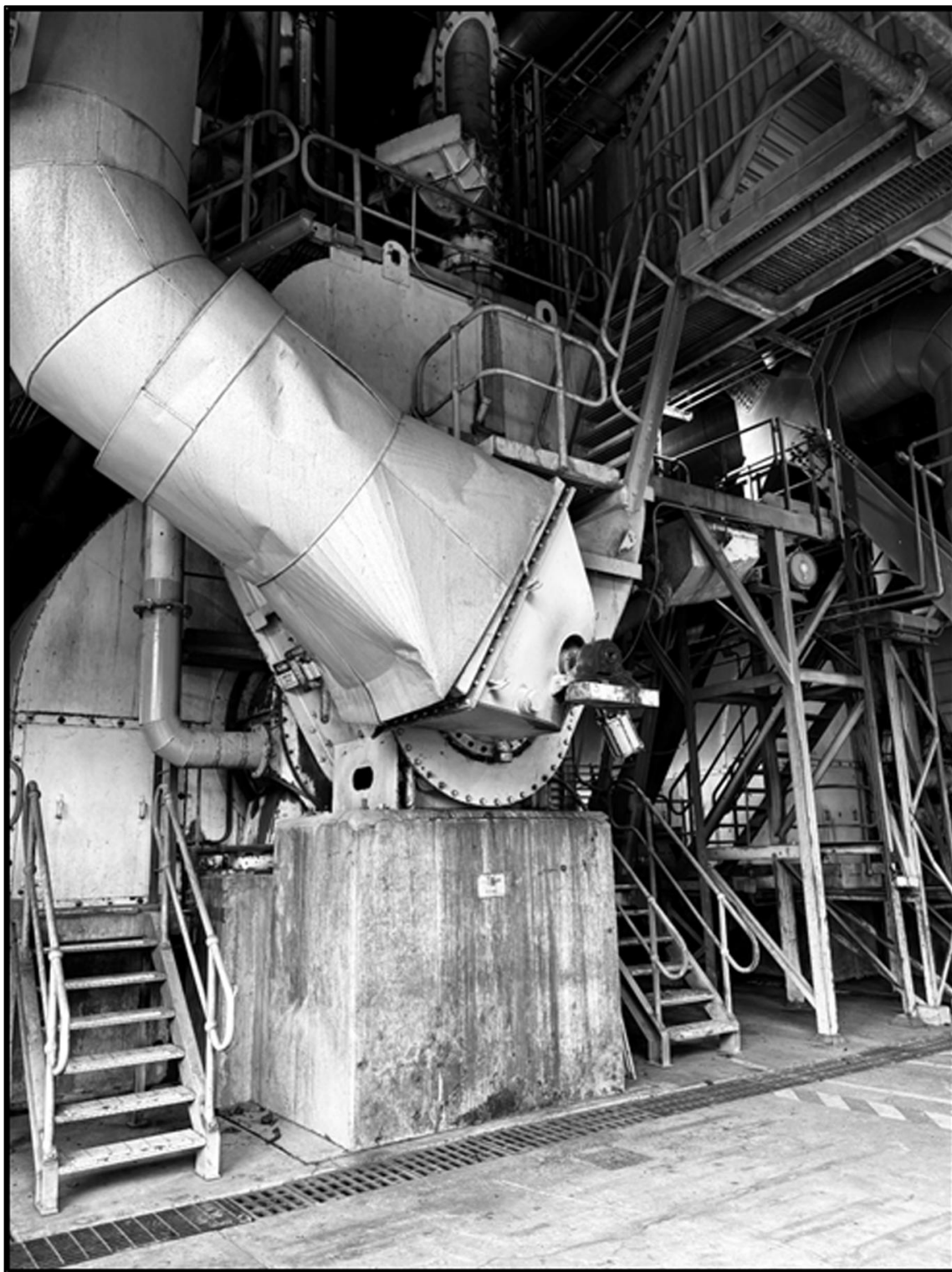


*Figure 28 Pulverising Fuel Ball Mill, November 2024  
(Ken Thornton)*



*Figure 29 The Dry Ash Removal system was not originally fitted. November 2024  
(Ken Thornton)*

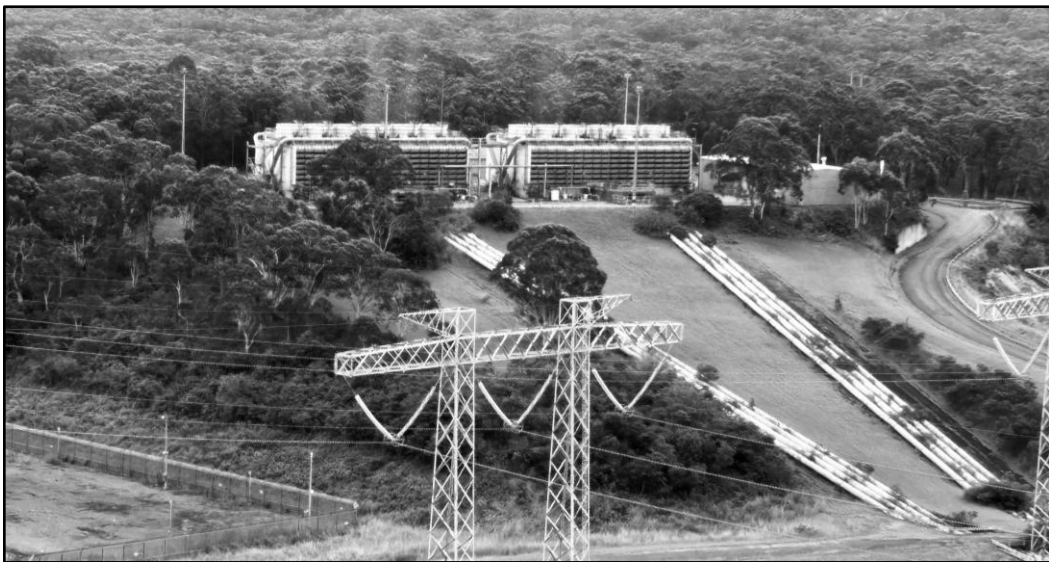


*Figure 30 The Auxiliary Cooling Water Towers sit on a small hill to west of the station. November 2024  
(Ken Thornton)*

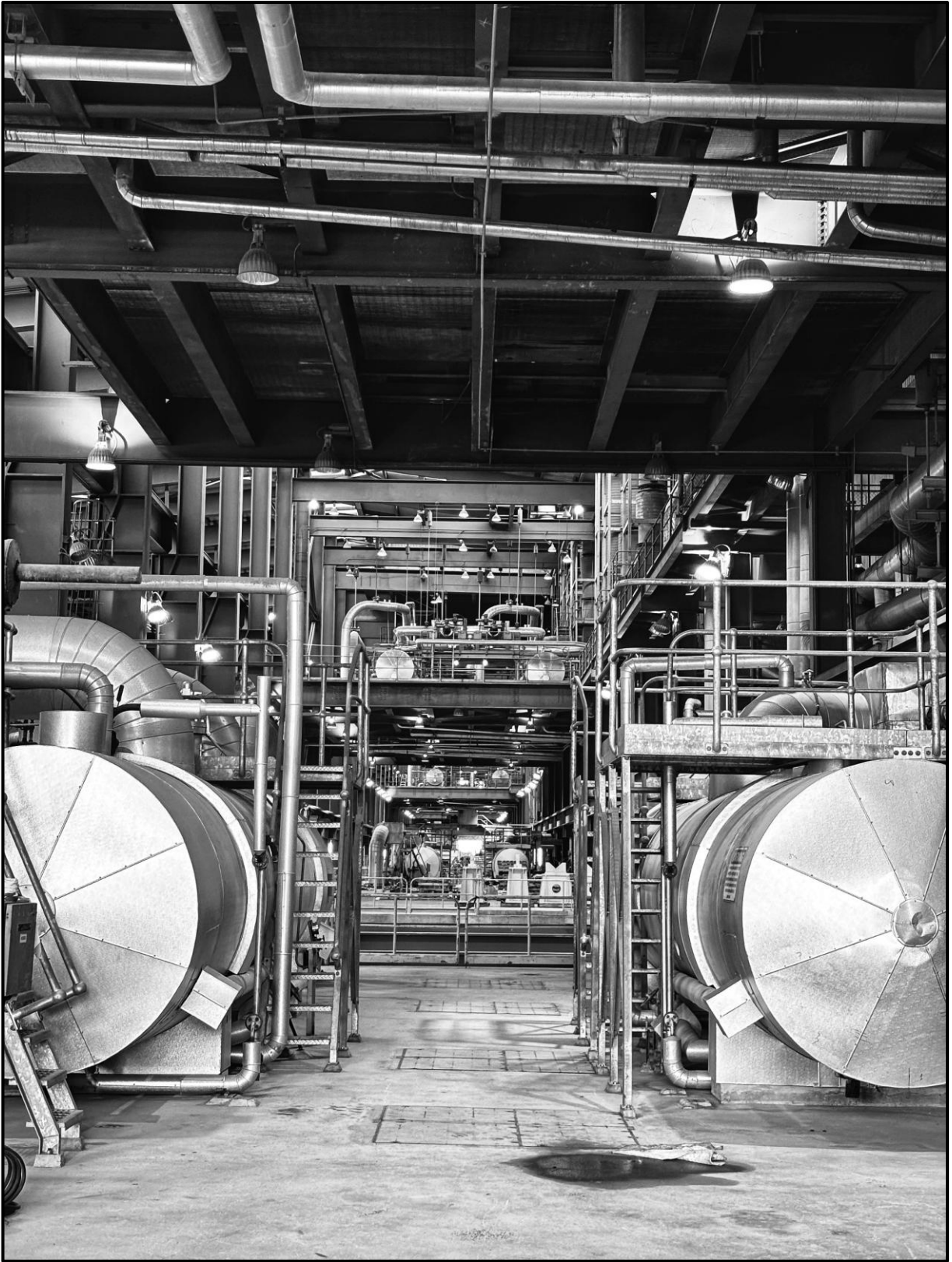


*Figure 31 Feedwater Heaters, November 2024  
(Ken Thornton)*

## Location

The power station is named after the nearby Lake Eraring. The name derives from the Aboriginal term "that which gleams or glitters."<sup>2</sup>

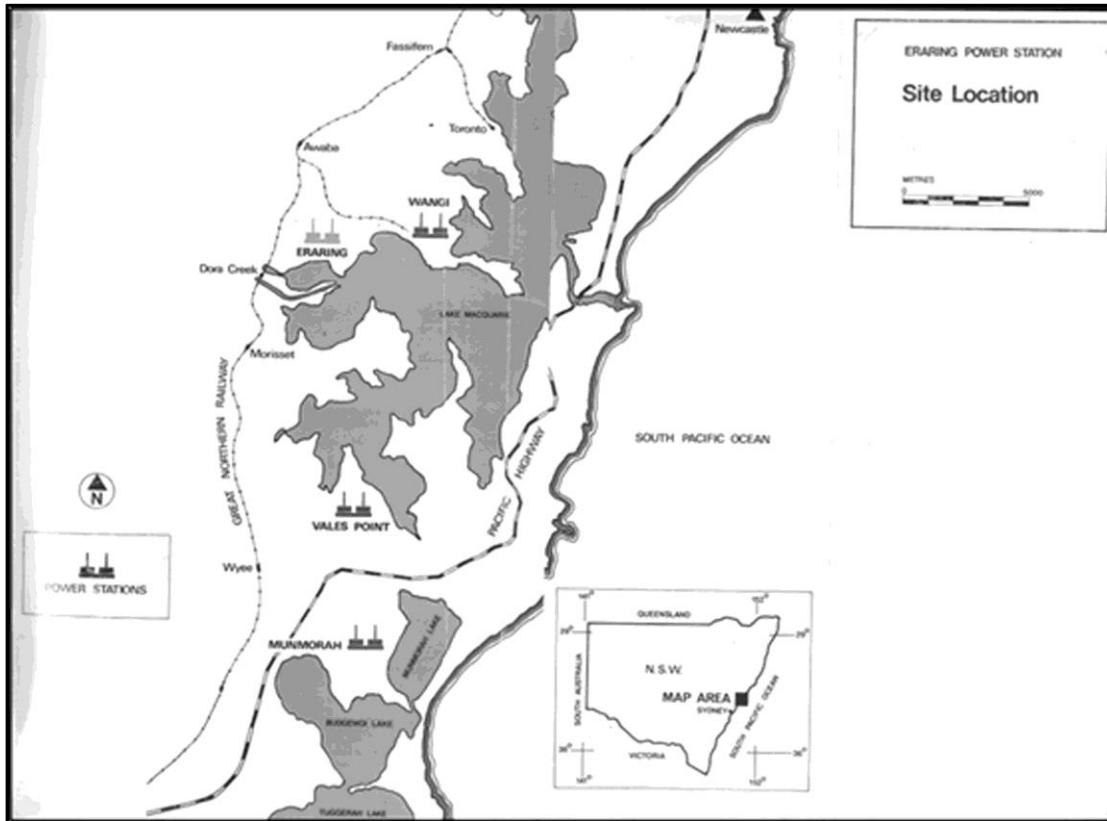
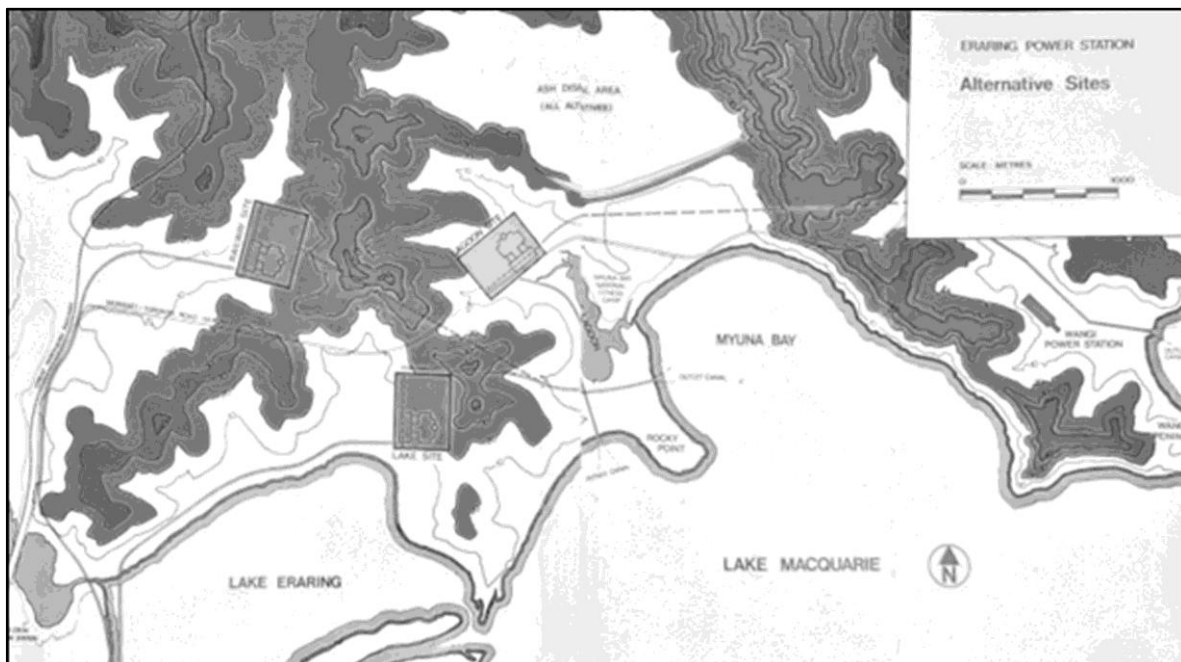


Figure 32 Site location. Above in relation to Lake Macquarie. Below alternative sites



During the initial planning for the station, three sites were considered, all within the general area of Lake Eraring. The lake site was situated on the northern foreshore of Lake Eraring.<sup>3</sup> The Lagoon site was on a relatively flat area at the head of "The Lagoon." It infringed on the alignment of the Toronto-Morriset road. Water would be drawn from Lake Macquarie south of Rocky Point through a 1.2 km-long canal and discharged to the eastern side of the Wangi peninsula. The chosen site, the Railway site, involved more expenditure than the other two sites because of less favourable foundation conditions.

Circulating water is drawn from Bonnell's Bay through submerged conduits under Dora Creek, an open canal west of Lake Eraring, and discharged via a tunnel into Myuna Bay.

In August 1975, the ECNSW's Environmental Impact Statement for the station noted that the site is approximately 9 km south of Toronto and 7 km north of Morisset.<sup>4</sup> Toronto had a population of 10,000, and Morisset had 3,000. The township of Wangi is approximately 5 km northeast, with a population of 3,000. The township closest to the station is Dora Creek, about 3 km south, with a population of about 1,500. About 200 people lived in the Eraring area, many on or close to the foreshore of Lake Macquarie. There was a small public school at Eraring, and the community relied on the nearby towns of Toronto and Morisset for shopping and similar community services.

### **The Country of the Awabakal People<sup>5</sup>**

The power station is located in the traditional country of the Awabakal people. The traditional boundaries of the Awabakal tribe were more expansive than the current Local Government Area boundary or the boundary of the Awabakal Local Aboriginal Land Council.

While Lake Macquarie was central to the Awabakal people, as was the Hunter River estuary, there are several different versions of the detailed boundaries of the country of the Awabakal. The Awabakal appear to have been people of the coast, estuaries, lakes, and wetlands. Still, they also had an attachment to the rugged sandstone country through the Sugarloaf and Watagan Ranges. The traditional land of the Awabakal people was bounded to the north by the Worimi, to the west by the Wonnarua, to the southwest by the Darkinjung, and to the south along the coast by the Kuring-gai people.

The Rev Lancelot Threlkeld (1828) described the boundaries of Awabakal (people of the plain [Lake] surface) country as: "The land bounded by south Reid's Mistake, the entrance to Lake Macquarie and north by Newcastle and Hunters River, west by Five Islands at the head of Lake Macquarie." Threlkeld (1825) also stated that "the natives here (i.e., the people around Lake Macquarie, where his mission was located) are connected in a circle extending to the Hawkesbury." This would extend the boundary of Awabakal activity and interactions north and south well beyond Lake Macquarie and the Hunter River. However, this does not necessarily imply that the traditional Awabakal tribal country extended to these areas.

The exact western extent of Awabakal country is also difficult to define. Some early ethnographic reports suggest that the Awabakal people may have been the most prominent clan of several groups in the coastal part of the lower Hunter region. Related clans included the Pambalong, Ash Island, and Cooranbong groups. Awabakal was the largest group.

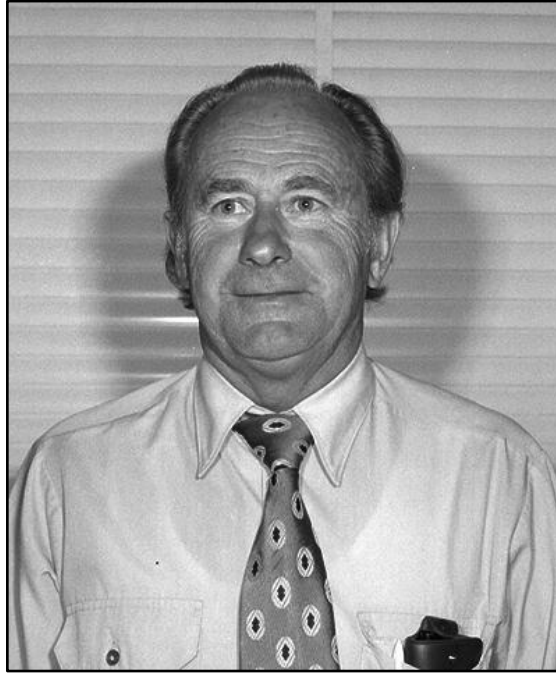


*Figure 33 Jack Maher, first Power Station Superintendent, October 1981  
(ECNSW CN80.0009)*

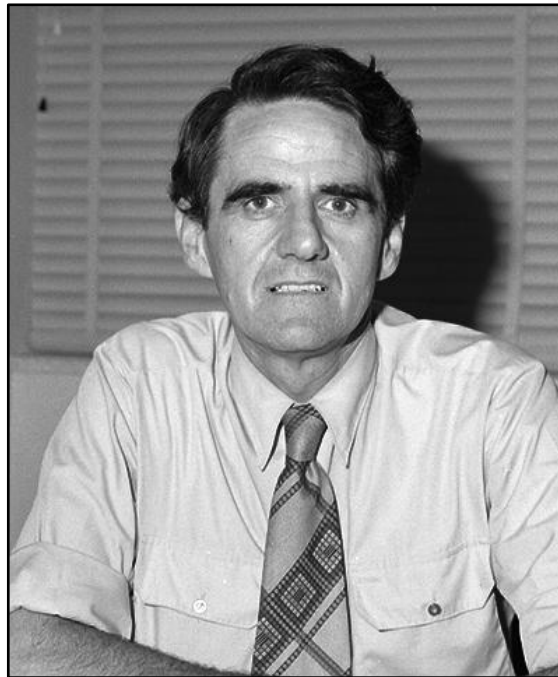


*Figure 34 Alan Shields, first Assistant Power Station Superintendent, October 1981  
(ECNSW CN80.0006)*

## Before a power station was even thought of

What would you think about reading press statements such as "cosy rural backwater facing uncertainty," "Residents vocal in opposition to power station project," or residents asking at regular intervals, "When will we have (to) go? Only the Electricity Commission can tell." These comments from late 1972 were among the earliest objections to the construction of Eraring. They were met with a "studied but definite reply that the project will proceed in the distant future." The *Newcastle Morning Herald* noted that "the tenor of life at Eraring is much the same despite the threat of industrial intrusion. Fishermen still haul their nets along Simpson's Beach, and the school continues its task in a bushland setting."<sup>6</sup>

These reactions to the station's construction are only part of the story of European presence that stretches back to early colonial times. It reaches back to Lt. Percy Simpson, the first European to own land in the area, to the attempt in 1840 to establish a port to rival Newcastle on the northern shore of Lake Eraring, and to the 1910 subdivision by the Excelsior Land Company that saw the village of Eraring established.

Perhaps the first reference to the area near the mouth of Dora Creek is on an 1826 map by Major James Morisset. The area is labelled as 'Yererung.' In 1839, the Rev. Lancelot Threlkeld, who played a significant role in the early development of Toronto, referred to the area as 'Irriring.' Lt. Simpson, the first landowner, referred to the area as 'E-ra-ring.' This is obviously the closest to the present-day spelling. Still, it indicates that all three names had the same Aboriginal origin.

Lt. Percy Simpson was initially granted 2,000 acres near present-day Cooranbong in November 1822. In 1825, he was awarded a further 2,000 acres in the same area. By 1826, land clearing had begun on the two grants, which Simpson had named 'Kaourumbung.' Also, in 1826, Simpson applied to have his grant surveyed. However, John Oxley, the Surveyor-General, found two separate entries for Percy Simpson, each of 2,000 acres at Kour-an-bong. He thought one entry had been made twice and subsequently cancelled the second one.

It was some time before the administrative error was discovered. Simpson chose and was granted 2,000 acres on the northern side of Dora Creek near its mouth. The record of the grant refers to this as 'E-ra-ring.' By 1837, one year before the new grant was finalised, Simpson had been appointed Surveyor of Roads and Bridges at Singleton. He had previously sold his original grant and now saw no need to keep his land at E-ra-ring. In trying to exchange this land for land in another part of the colony, Simpson wrote to the Colonial Secretary saying that 90% of the 2,000 acres at E-ra-ring "consists of barren scrub, without freshwater except what is procured from sunken wells and (has) difficult access by land." When the request to exchange the land was denied, Simpson sold it. After several owners, it was purchased in 1840 by Mr. Smart, a Sydney land speculator.

The *Australian* of 16 July 1840 ran an advertisement for the sale of land at Newport on the northern shore of Lake Eraring, extending to the shore of Lake Macquarie. The paddle steamer 'Kangaroo' was used to show prospective buyers the site. The land speculators wished to establish a port rivalling Maitland and Newcastle. It was hoped that settlers from the Upper Hunter would send their produce via Newport rather than down the Hunter River. In March 1841, a half-acre plot sold for £10; however, most of the lots were purchased for their resale value. Some lots were later sold at a 75% profit. Settlers in the area were usually engaged in agriculture and timber felling.

While the Newport venture met with some initial success, the availability of good agricultural land was limited, and as a result, not many lots were sold. Wool growers preferred the port facilities of Newcastle and Sydney over those of Newport.

In 1885, the Excelsior Land and Investment Co. and Bank Ltd. purchased an estate at Eraring, which comprised part of Simpson's original grant and part of the Newport estate. In 1910, this estate was subdivided into small farm blocks. The brochure advertising the Eraring estate described the area as having a "dignified history of colonial settlement...a place where gentility can reign supreme."

The opening of the northern railway, particularly the station at Dora Creek in 1889, improved transportation in the area. Before this date, boats, draught horses and carts had been the primary forms of transportation. Even after the railway, the owner of a horse and sulky was looked at the same way as a Rolls-Royce or a Porsche would be viewed today.

The first car, a Model-T Ford, arrived in 1925. However, before this, as there were few residents, the Council had declined to repair the roads, so the settlers did it themselves. Grading was done with a homemade grader pulled by horses. Other notable events include the opening of the Public School in January 1924, with approximately twenty pupils. It closed in 2015. The Post Office operated as a receiving office until January 1927, when its status was upgraded to a full postal office. It was closed in November 1973. The water supply was put through in late 1941, and electricity was connected in 1936.

Perhaps the most notable person to reside in the area was Dr. Leighton-Jones. During the 1930s and 1940s, he became known as the 'Monkey Doctor' because of his use of the glands of monkeys in rejuvenation operations. The monkeys were kept on the Doctor's property at Eraring while the procedures were done at a private hospital in Morisset.

After World War II, the younger generation took advantage of improved roads and increased car ownership to move away in search of education and employment. While the construction and operation of the power station saw an influx of workers, few settled in the area, as most were already established within reasonable travelling distance.

In 1910, several streets were formed when the Excelsior Land Co. subdivided the area, which now includes the power station. Cross Street, north of Rocky Point Road, is now Construction Road up to the station's back gate. North Street started at the top of the hill, where the station's main entrance comes off Rocky Point Road. It ran in a northerly direction up to where the Coal Plant now stands. Thus, Mill Alley between the PF Mills and the Ash Hoppers runs in the general area of North Street. As Lot 14 North Street was fairly deep, it is historically irrelevant, perhaps irreverent, to note that 1A ID Fan is in the general area where any self-respecting settler would have built an outside toilet. One shudders to contemplate what this means. Or, in the immortal words of Peter Tollard, an APPO in Liddell's first Operator School in the early 1970s, "Hands up all those that don't give a...."



*Figure 35 From the southwest, June 1984  
(ECNSW 13769)*

## **The early days**

The *Newcastle Morning Herald* made one of its first comments about Eraring in October 1969, reporting that the ECNSW had recently completed a twelve-month study into the feasibility of siting a large thermal power station on the western shores of Lake Macquarie. While the study investigated possible sites between Myuna Bay and Bonnells Bay, the area near Lake Eraring was identified as the preferred location. There was no indication of a potential start date for construction.

With the general approval of the Lake Macquarie Municipal Council, the ECNSW began acquiring land, mainly subsistence farms and uncleared bush. In August 1969, a map detailing the land owned in the area and the additional land required for the project was published.

In November 1969, the local member, Mr. Harry Jensen MLA, expressed public concern about the proposal. He commented that perhaps a more suitable site could be found and that compensation for any land acquired by the ECNSW for the project should be fair and equitable.

The defence implications of adding to the accumulation of power stations within a reasonably small area were of further concern. In 1969, Wangi, Vales Point, and Munmorah generated 46 per cent of the state's power requirements. This percentage would increase further in 1978 with the scheduled commissioning of 1320 MW at Vales Point 'B'.

At about this time, the Secretary of the Eraring Progress Association commented that residents were realising how much their future would be disturbed by the power station project. Reports indicated that a canal was set to run through the centre of a well-established family's home. The proposed acquisition of land for the project met with a bitter reaction. While some were beginning to accept the inevitability of the march of progress, they were nevertheless concerned about the terms of 'equitable compensation.' To these people, this meant payment for the acquired land and sufficient finance to resettle comfortably or re-establish their livelihood elsewhere.

The issue of land acquisition and compensation was still evident in April 1971. The *Herald* reported that an "atmosphere of uncertainty" existed for owners who had not disposed of their property to the Commission."

Several significant technical aspects remained unresolved in the project's early stages. The lack of information, the release of what could be termed 'draft concepts,' or even misleading information, only compounded the disquiet felt by the local community. In May 1970, it was rumoured that the ECNSW had plans to redirect Dora Creek into Bonnells Bay opposite Goat Island. In April 1971, it was reported that the Inlet Canal would be cut through near Stingaree Point, and the Outlet Canal would pass through Whitehead's Lagoon. Only in October 1975 was the final configuration of the Inlet Canal under Dora Creek and the Outlet Canal discharging into Myuna Bay mentioned in the local press.

The initial Environmental Impact Statement (EIS) released noted that the two-unit power station was required to meet the expected power demand in the early 1980s. It also outlined that this first stage would allow for the later installation of two more similar units.



*Figure 36 The generator rotor was removed for inspection.*

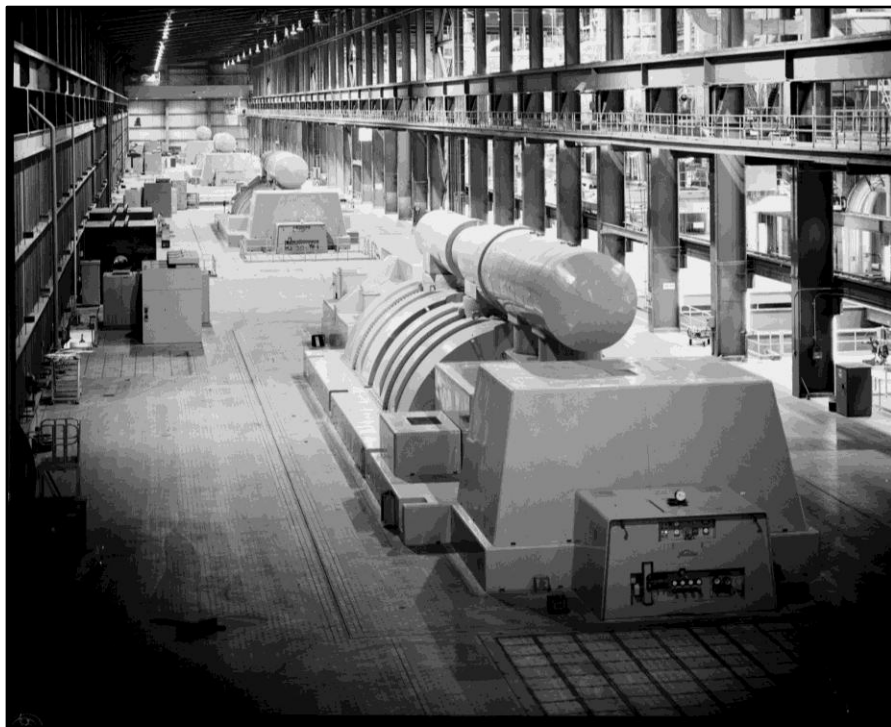
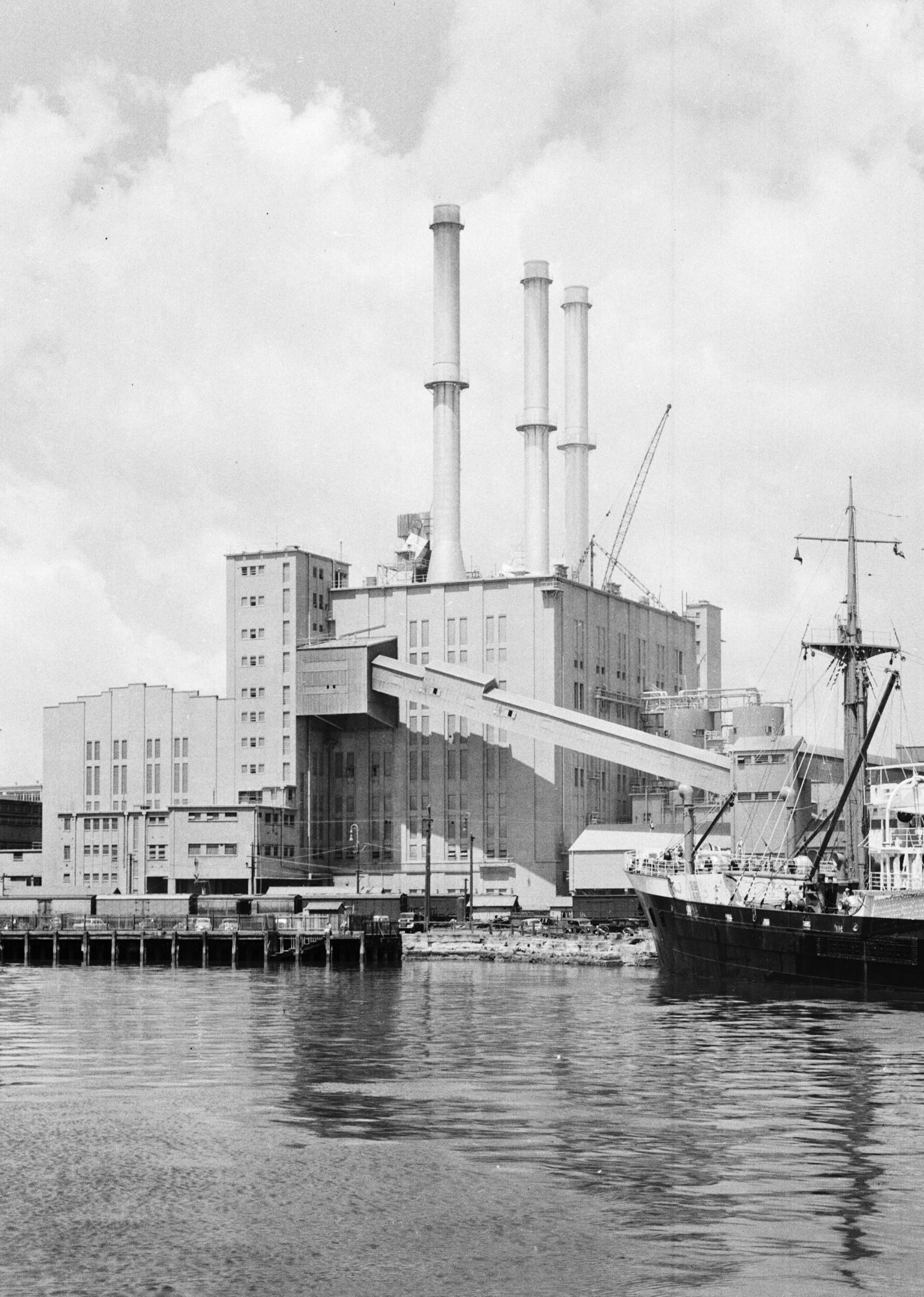


*Figure 37 Turbine Floor, June 1984*



## CHAPTER 3 THE DEVELOPMENT OF POWER STATIONS IN NEW SOUTH WALES<sup>7</sup>

Eraring is not a one-off thermal power station. It is part of over a century of power station development in NSW that began at Tamworth in 1888. The ECNSW was responsible for expansion in the second half of the 20th century. That development spanned from the early 1950s, with the acquisition of its predecessor's stations, to the commissioning of Vales Point, Munmorah, in the 1960s, Liddell, Wallerawang, and Vales Point B in the 1970s, Eraring and Bayswater in the 1980s, and Mt Piper in the early 1990s.

Several significant factors characterised the New South Wales electricity generation and transmission industry in the first half of the twentieth century. Foremost among these were the fragmented technical and ownership arrangements of the power stations run by State and Local Government authorities or private enterprises. Sydney County Council operated Pyrmont and Bunnerong Power Stations. At the same time, the NSW Government Railways ran Ultimo, White Bay in Sydney, Zarra Street Power Station in Newcastle and Lithgow Power Station in the state's central west. The Electric Light and Power Supply Company, a private operator, ran Balmain Power Station. The state government's Public Works Department ran the Port Kembla Power Station and Burrinjuck Hydroelectric Station on the Murrumbidgee River. Small generating and transmission facilities were spread through several regional generating authorities and distributors. The fragmentation of generating bodies, combined with minimal commissioning of new capacity during the Second World War, rising demand, and inadequate maintenance, contributed to the general decline of the industry. The resulting power shortages in the immediate post-war period were instrumental in the State Government establishing the ECNSW and centralising the sector in May 1950.

As crucial as centralised control of the state's electricity production was, the physical interconnection of the state's High Voltage (HV) transmission networks was perhaps of equal, if not greater, significance. The physical separation of the HV transmission networks was resolved in the early years of the Second World War (1941-1942), as defence considerations hastened their linking to form a single network. Even so, electricity authorities kept ownership and operational control of their section of the new interconnected state network until they were transferred to the ECNSW.

In the 13 years between its establishment in May 1950 and the commissioning of the first unit at Vales Point in April 1963, the Electricity Commission added 1703 MW to its generation portfolio. These additions comprised 51 MW of diesel, 109 MW of hydroelectric power, and 1,542 MW of steam. Of the steam component, 167 MW were installed across small stations at Lithgow, Liverpool, Maitland, Muswellbrook, Penrith, Port Kembla, Ulan, and Tamworth (not formally transferred to the ECNSW until 1957).<sup>8</sup>

*Pyrmont B, Sydney, January 1956 (ECNSW 00631)*



*Bunnerong*



*Balmain*



*Pyrmont*



*White Bay*



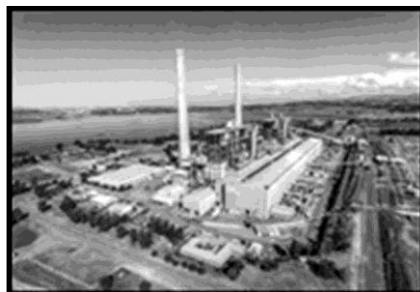
*Wangi*



*Vales Point A*



*Munmorah*



*Liddell*

## **The 1950s: Post-War Expansion and Hydroelectric Development**

In the 1950s, New South Wales (NSW) embarked on significant industrial growth, fueled by post-World War II reconstruction and immigration. This era saw the beginning of major hydroelectric projects, notably the Snowy Mountains Scheme, one of the world's most complex integrated water and hydroelectric power schemes. Initiated in 1949 and continuing for several decades, it was pivotal in meeting the burgeoning electricity demands of NSW and the wider south-eastern Australian grid. The scheme also symbolised a technical and engineering feat, contributing to regional development and water management. The fragile nature of post-war NSW electricity supplies forced the government to centralise the generation and transmission industry in May 1950 and establish the Electricity Commission of New South Wales.

## **1960s-1970s: Coal Dominance and the Rise of Centralised Generation**

Exploiting the extensive coal reserves in NSW continued to focus on coal-fired power stations. This era was characterised by the construction of large, centralised coal-fired plants, such as Vales Point and Munmorah. These plants were strategically located near coal mines to minimise transportation costs, reflecting a reliance on coal that would define the state's energy landscape for decades. The centralisation of power generation aimed to achieve economies of scale and improve efficiency, driven by the state's increasing industrialisation and the electrification of homes and businesses.

## **1980s: Diversification and Environmental Considerations**

During the 1980s, coal remained dominant as Eraring and Bayswater were commissioned. However, the environmental impact of energy generation began to receive more attention. A growing interest was in diversifying energy sources to include more sustainable options. The NSW government and energy companies started exploring alternative energy technologies, though significant investments in renewables were still in their emerging stages. During this period, the state also began to experience the deregulation of its electricity market, a process that would accelerate in the 1990s. This shift aimed to increase competition and efficiency within the industry, influenced by broader national and global trends towards market liberalisation.

## **1990s: Market Liberalization and the Lead-Up to Privatization**

The 1990s marked a significant transformation in the NSW electricity sector with the introduction of the National Electricity Market (NEM) in 1998. This period saw the restructuring of the state-owned electricity commission into several entities, separating generation, transmission, and distribution to foster competition. The establishment of the NEM facilitated the interstate trade of electricity, aiming to improve the efficiency and reliability of the power supply across Australia's eastern and southern states.

The end of the 20th century saw increasing public and governmental awareness of climate change, setting the stage for early 21st-century energy policies focused on reducing greenhouse gas emissions and promoting renewable energy sources. However, due to their existing infrastructure and the state's abundant coal resources, coal-fired power plants continued to be the backbone of NSW's electricity generation. However, Pacific Power, foreseeing the trend to renewables, commissioned the Crookwell Wind Farm in 1998. It was Australia's first grid-connected wind farm with eight 600 kW wind turbines.

## **Electricity Generation Industry Post-2000**

Significant shifts towards sustainability, regulatory changes, and the evolution of technology mark the New South Wales electricity generation industry post-2000. This period reflects global trends in energy transition, focusing on reducing carbon emissions and integrating renewable energy sources.

At the dawn of the 21st century, NSW's electricity generation relied heavily on coal-fired power plants. The state's energy policy and infrastructure were built around the abundant coal reserves. However, the growing concern over climate change and Australia's commitment to international environmental agreements began to influence a gradual policy shift towards renewable energy.

### **Regulatory Changes**

The Australian government introduced the Renewable Energy Target (RET) in 2001, aiming to increase electricity generation from renewable sources. This policy was pivotal in driving investments towards NSW's wind, solar, and hydroelectric power projects. The RET and state-specific initiatives laid the groundwork for a diversified energy portfolio.

### **Privatisation and Market Reform**

A significant development in the NSW electricity sector was the gradual privatisation and restructuring of the state-owned electricity assets. The process, which gained momentum in the late 2000s and early 2010s, aimed to increase efficiency and competition and attract private investment. This move also included the privatisation of retail and generation assets, fundamentally changing the industry's landscape. With a portfolio that includes coal, gas, and renewable energy sources, Origin Energy exemplifies the transitional energy companies moving towards a more sustainable mix. Their involvement in wind and battery projects marks a significant shift from traditional energy sources.

### **Rise of Renewable Energy**

The push for renewables led to the development of various wind farms and solar projects across NSW. Solar energy received a substantial boost through government incentives for rooftop installations and the construction of large-scale solar farms. Wind energy also saw significant growth, with several large wind farms commissioned. Hydroelectric power, primarily through the Snowy Hydro Scheme and Origin's Shoalhaven Scheme, continued to play a crucial role, especially in peak demand periods and as a backup for intermittent renewable sources.

### **Coal and Gas**

Despite the shift towards renewables, coal remained a significant part of NSW's energy mix. However, aging coal-fired power stations began facing decommissioning or were earmarked for closure, signalling the end of an era. Natural gas emerged as a transitional fuel, offering lower carbon emissions than coal and providing flexibility to support renewable energy sources.

### **Technological Advances and Challenges**

Integrating renewable energy into the grid posed new challenges, requiring advancements in grid management and storage technologies. Battery storage, demand management, and innovative grid technologies became focus areas. These advancements aimed to enhance the reliability and

stability of the electricity supply amidst the increasing share of intermittent renewable energy sources.

## **Looking Forward**

The ongoing evolution of NSW's electricity generation industry is part of a broader transition towards a sustainable and low-carbon future. The focus on innovation, energy storage solutions, and continued investment in renewable technologies will likely define the sector's trajectory in the coming decades.

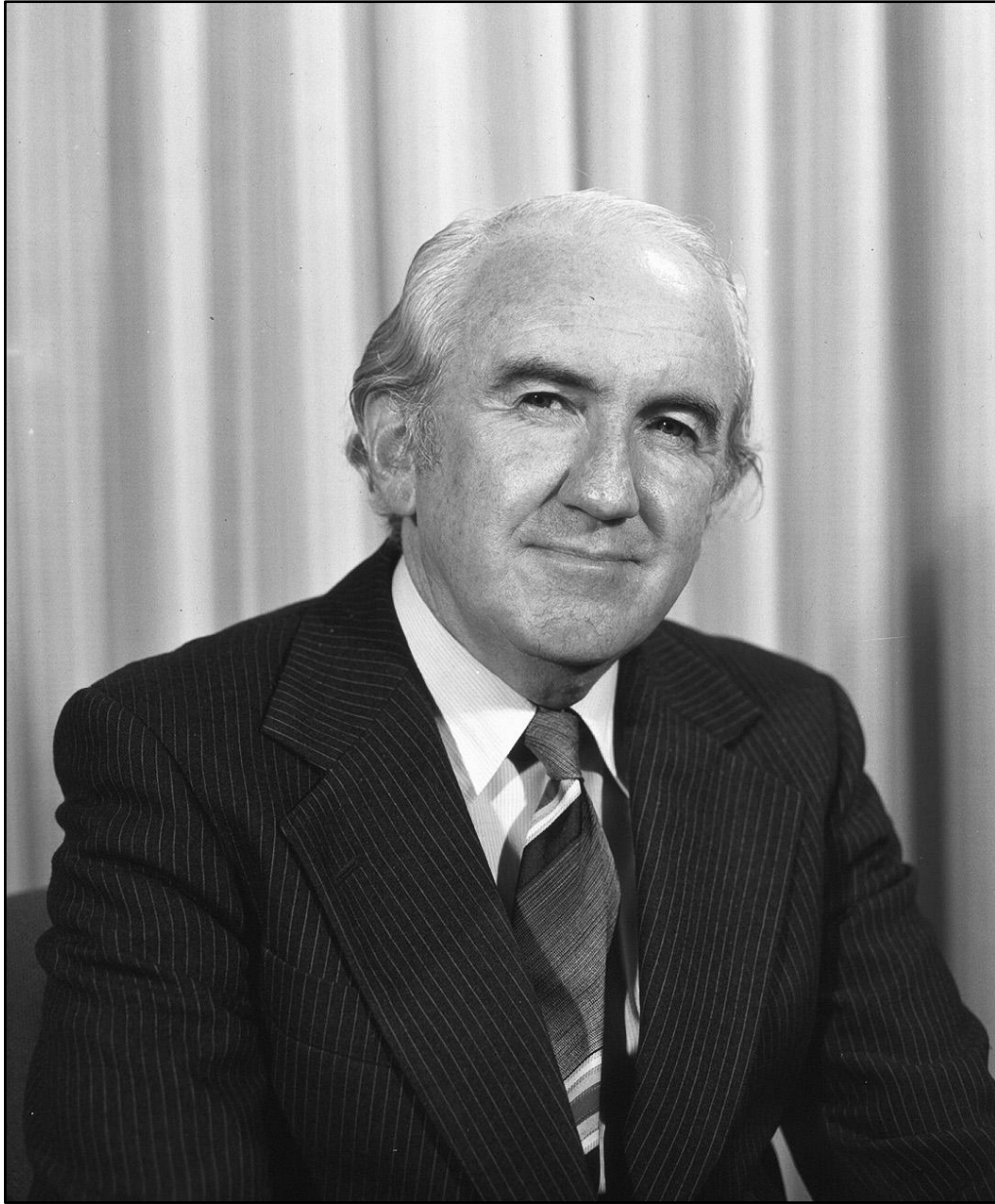


*Figure 39 Frank Brady, August 1984. General Manager of the Electricity Commission when Eraring was opened.  
(ECNSW CN80.0030)*

## **The Corporate Road to Eraring**

Crucial to any study of Eraring are the tasks set by the NSW Government for the Electricity Commission and the extent to which these were achieved. The Electricity Commission/Pacific Power Annual Reports up to the mid-1990s detail the primary corporate aim of providing bulk electricity. Whether the term used was "supply" as in 1952, "generate" in 1980, or "safe, reliable, and adequate at the lowest possible, practicable cost" in 1982 and 1990, the goal was the same: the provision of bulk electricity.<sup>9</sup> These and other Annual Reports point to increases in the quantity of electricity produced and sold at average annual prices that declined over the thirty years to the mid-1970s. Later Annual Reports, however, record a slowing in demand and cost increases. The factors that had resulted in declining prices in the earlier period diminished or were exhausted in the latter. Lower fuel cost advantages from siting power stations on the coalfields were reduced as less electricity was produced in metropolitan power stations. Even the benefits of higher outputs at higher production efficiencies and economies of scale declined as generator size stabilised at 660 MW, and the last major baseload power stations, Bayswater and Mt Piper were commissioned in the mid-1980s and early 1990s.

The Electricity Commission's primary corporate objectives, while perhaps similar in wording or intent during its tenure, presented themselves as different critical issues depending on its operating environment. Its success in achieving its primary goal and related critical issues was crucial to remaining at the centre of NSW's electricity industry for over forty years. As with the SCC's (Sydney County Council) demise as an electricity generator following its failure to resolve critical issues confronting the post-war supply industry, Pacific Power's (the ECNSW's successor) inability to resist disaggregation in 1996 and its loss of the generation portfolio in 2000 were precursors to its demise in 2003. Despite achieving its corporate objectives, in the government's eyes, Pacific Power was inept as an electricity trader and incompatible with a competitive national electricity market.

### **Eraring, a sixth-generation power station**

The Electricity Commission's chairperson, A.W.B. Coady, described Liddell as a fourth-generation power station in June 1967. Even though it had 660 MW units, Vales Point 'B' did not have natural circulation boilers and, by Coady's criteria, would have been a fifth-generation station. The last three stations the Electricity Commission built, Eraring, Bayswater, and Mt Piper, were sixth generation.

Pymont, White Bay, Ultimo, Zarra Street, Balmain, and Bunnerong were the original power stations in or near the load centres of Sydney and Newcastle and formed Coady's first-generation stations. The second-generation stations, Wangi, Tallawarra, and Wallerawang, were the first to be on the coalfields. This second generation also included the small (20 MW) but strategically important 'Package Stations' at Liverpool, Penrith, Port Kembla, and Maitland. Vales Point A and Munmorah stations of the third generation were significantly larger and featured advanced technical advancements that increased their efficiency. These included using reheated steam, which improved performance characteristics, especially thermal efficiencies. From the late 1950s to the 1970s, ECNSW aimed to meet a 9% annual increase in demand and maintain flat production costs. To achieve these goals, they had to build a power station substantially larger than Vales Point or Munmorah and one with lower production costs.

In 1960, Vice Chairman Fred Sykes envisaged four future 1,000 MW power stations, each comprising four or six generating units. The first, Vales Point on southern Lake Macquarie, was

announced in December 1957.<sup>10</sup> The second, to be called Lakeside, was envisaged at the approximate location of Munmorah station. This station was approved in February 1961.

Hunter Valley #1 was to be in the mid to Upper Hunter Valley. The initial site was located at Ravensworth, near Swamp Creek, with cooling facilities that included a pond for heat dissipation.<sup>11</sup> However, geological investigations revealed that significant coal reserves within the proposed storage area would not be recoverable if the power station and dam were to be constructed. The alternate and eventual power station site was located next to Gardiner's Creek, between Antine and Liddell.

Hunter Valley #2 was predicted to be in the general area of Kurri Kurri and was the only location Sykes did not foresee. It is notable that Chairman H.G. Conde and Sykes, in the late 1950s, set the course of major power station development in the Hunter area up to the mid-1980s. The commissioning of a 1,320 MW extension to Vales Point in 1978-1979, Eraring (2,640 MW) between 1982 and 1984, and Bayswater (2,640 MW) in 1985-1986, while not foreseen by Conde and Sykes illustrate their foresight in following EBASCO's recommendation that the northern coalfields be the location for additional major power stations.<sup>12</sup>

The 200 MW Vales Point units were commissioned in April 1963, January 1964, and November 1964, with a 275 MW unit in May 1966. Munmorah's first unit was commissioned in February 1967.<sup>13</sup> Munmorah continued the ECNSW's preference for British technology. Like Vales Point, the media extolled Munmorah as a "power station giant," a "successful white sentinel."<sup>14</sup> The *Newcastle Morning Herald* went so far as to suggest that Munmorah's construction exhibited a "feeling of excitement and awe about huge engineering. It is because of man's ability to conquer the environment and harness its tremendous power."<sup>15</sup>

As with Vales Point before and later stations, Munmorah incorporated some significant engineering improvements and innovations. These included the first and only use of down-fired boilers and, of vital importance, the first use in Australia of an all-electric control system instead of a pneumatic system used at Vales Point. Munmorah's digital computer systems were also a first for the Electricity Commission of New South Wales and Australia.

A cursory look at the commissioning dates of the generating units from #1 at Vales Point A in mid-1963 to Mt Piper in late 1993 would suggest a steady progression, with units within a station often commissioned at less than twelve-month intervals. Impressive as this may be, from an organisational perspective, it also indicates that multiple power stations were frequently in development simultaneously. On 30 June 1979, for example, construction work was in progress at four power stations.

*Electricity Commission generating units  $\geq 200$  MW commissioned between April 1963 and December 1993*

| Power Station | Date Commissioned | Capacity (MW) |
|---------------|-------------------|---------------|
| Vales Point 1 | 7-Apr-63          | 200           |
| Vales Point 2 | 10-Jan-64         | 200           |
| Vales Point 3 | 27-Nov-64         | 200           |
| Vales Point 4 | 24-May-66         | 275           |
| Munmorah 1    | 23-Feb-67         | 350           |
| Munmorah 2    | 22-Mar-68         | 350           |
| Munmorah 3    | 18-May-69         | 350           |
| Munmorah 4    | 21-Oct-69         | 350           |
| Liddell 2     | 17-May-71         | 500           |
| Liddell 1     | 13-Jan-72         | 500           |
| Liddell 3     | 7-Dec-72          | 500           |
| Liddell 4     | 25-Nov-73         | 500           |
| Wallerawang 7 | 8-Jul-76          | 500           |
| Vales Point 5 | 12-May-78         | 660           |
| Vales Point 6 | 13-Dec-78         | 660           |
| Wallerawang 8 | 10-Oct-80         | 500           |
| Eraring 1     | 22-Mar-82         | 660           |
| Eraring 2     | 29-Nov-82         | 660           |
| Eraring 3     | 18-Jul-83         | 660           |
| Eraring 4     | 17-Apr-84         | 660           |
| Bayswater 2   | 12-Jun-85         | 660           |
| Bayswater 1   | 4-Dec-85          | 660           |
| Bayswater 3   | 19-Jun-86         | 660           |
| Bayswater 4   | 5-Dec-86          | 660           |
| Mt Piper 2    | 7-Dec-92          | 660           |
| Mt Piper 1    | 7-Dec-93          | 660           |



*Figure 40 Toshiba turbine nameplate, 2023  
(Ken Thornton)*



*Figure 41 Turbine Floor, November 1980  
(ECNSW 13328)*



## CHAPTER 4 THE DEVELOPMENT OF ERARING POWER STATION

In the early stages of developing Eraring, the first crucial step involved identifying the need, determining the size, and establishing in-service dates.<sup>16</sup> This phase required a meticulous examination of factors such as coal availability, cooling water, freshwater, labour, and proximity to load centres for efficient energy transmission.

As the project progressed, the conceptualisation phase involved feasibility studies, cost estimates, and financing. During this period, the ECNSW seemed largely self-financing, with minimal support from the NSW Government. However, a significant turning point occurred when the NSW Government requisitioned approximately \$700 million of ECNSW reserves, adding an unexpected twist to the financial landscape.

To finance a capital works program involving several power station projects, an Accelerated Electricity Development Program (AEDP) was developed.

Securing necessary permissions, including building and environmental approvals, was another critical aspect of Eraring's development. Land acquisition, including easements for the main site, cooling water, coal conveyors, transmission lines, roads, and other essential infrastructure, were pivotal in shaping the project's foundation. The project schedule was meticulously crafted, outlining sequential requirements and incorporating risk management strategies to ensure a smooth execution.

Transitioning into the design phase, a comprehensive approach was taken to identify all required plant components. Tender documents comprising technical specifications, commercial details, and delivery programs were prepared. Early engagement with key stakeholders and potential contractors was aimed at facilitating an optimal tender process.

The reception and examination of tenders, including technical analysis and clarification of design issues, paved the way for contract negotiation and consolidation. Integrating plant elements across contract boundaries and technical disciplines was challenging yet vital. Monitoring the progress of manufacturing components ensured adherence to schedules and pre-empted potential delays.

Throughout this phase, support persisted, extending beyond contractual matters to provide technical guidance and ensure a seamless transition into the subsequent construction phase.

Negotiating a Site Rates Agreement with unions and contractors marked the commencement of the construction phase. Site preparation involved clearing and levelling, setting up offices, and creating necessary facilities for the sizable workforce. The construction of foundations and structures, including civil works, boiler steelwork, and turbine block, unfolded with meticulous attention to detail.

*Mezzanine floor, October 2024*  
(Ken Thornton)

The delivery and erection of main plant items, alongside the construction of buildings and cranes, facilitated the creation of a comprehensive infrastructure. Coordination of switchboards, cabling, instrumentation, and controls was crucial as various plant components became available. Rigorous quality assurance systems, including thorough checks of components and power/control systems, were implemented to ensure the success of the commissioning phase.

The commissioning phase unfolded with the development of a broad commissioning program. Individual plant commissioning programs and procedures were established, with contractors responsible for their specific areas. ECNSW oversaw the coordination, with duty engineers and inspectors rotating shifts to ensure constant vigilance.

Significant milestones in commissioning included boiler airflow, test fires, chemical cleaning, system flushes, and turbine run-ups. Meanwhile, coal, ash, cooling water, and demineralisation plants were commissioned progressively to meet their respective tasks.

Ultimately, the commissioning phase culminated in the handover of the plant and documentation to the Generation Group, accompanied by assistance with warranty and operational issues. This marked the project's successful realisation, a testament to meticulous planning and execution throughout its development.

Whilst civil works on the site commenced as early as August 1976, construction of the first unit (boiler) began on September 5, 1978, and the fourth unit reached full commercial load on April 26, 1984.<sup>17</sup> The station operated as a base-load plant, and the units were reliable, achieving over 80% availability.

The contractors' workforce reached approximately 2,300 at the peak of construction works. The Electricity Commission's supervising staff numbered about 110. The Generation administration, operating, and maintenance staff at opening totalled approximately 680.

The cost of the power station project was \$1.653 million. However, additional construction work on roads, workshops, and amenities continued after opening. Installation of silencers on the ID Fan outlet ducts was a later addition.<sup>18</sup> Flyash NSW also installed a plant to collect and export 240,000 tonnes of fly ash per year from the Fabric Filter Dust Collection Plant. Approximately 17% of the yearly fly ash production would otherwise have been sent to the Ash Storage Dam.

### **Unit #1 went to 700 MW 31 days after synchronisation.<sup>19</sup>**

The following section is an extract from Peter Lawley and Jack Beesley's June 1982 report on the Commissioning and Initial Operation of Eraring #1 660MW Unit.<sup>20</sup>

Three groups within the Electricity Commission were the leading players in the construction and operation of Eraring: the Power Division's Design and Generation groups and the Project's Construction Group.

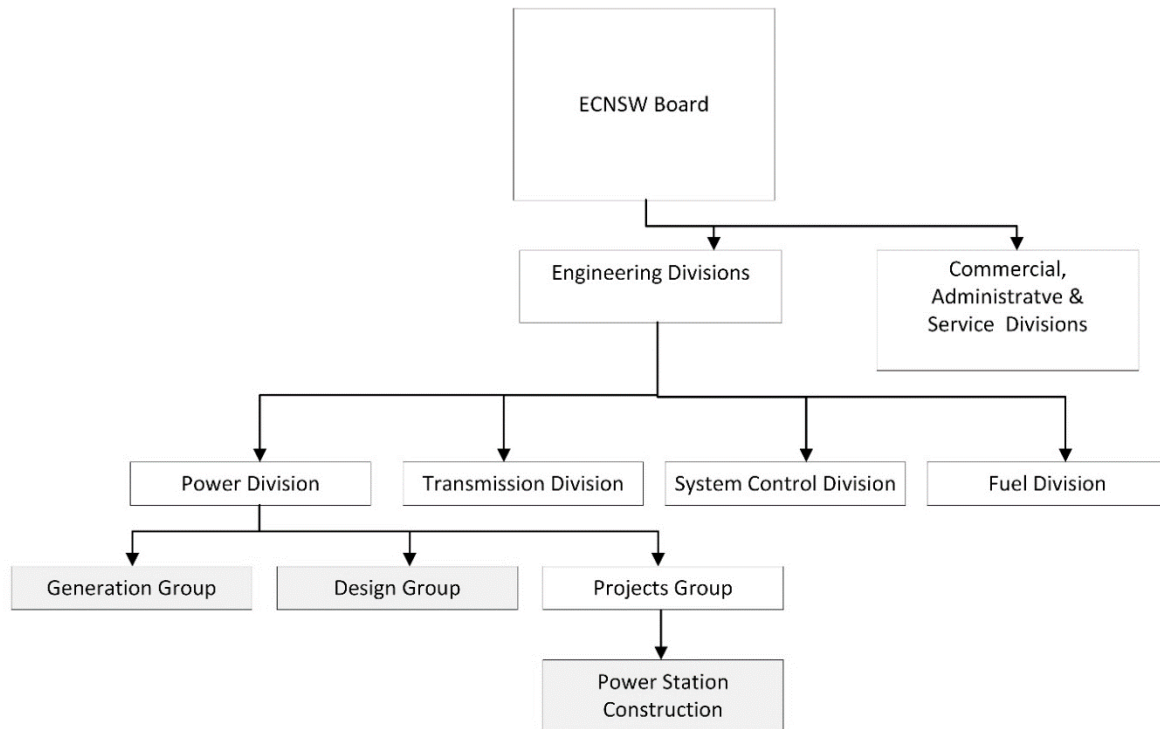


*Figure 42 Generation, Design and Construction Groups, 1982  
Amended from ECNSW 1982 Annual Report.<sup>21</sup>*

## Design

The Design Group specified the primary plant to be supplied under contract for Eraring. These contracts were let after a competitive tender process, with the detailed design of the plant being the responsibility of the contractor. The Design Group was also responsible for the overall administration of the various contracts.

### ***Projects-Construction***

The Commission's Construction Group was part of the Projects Branch and was responsible for the on-site administration of various contracts. This involved supervising contractors' erection and commissioning procedures to ensure compliance with the contract.

In particular, construction staff were directly responsible for pre-commissioning different systems that interfaced with plant items supplied by other contractors. For example, Construction was responsible for commissioning the remote control of all main plant auxiliaries, valves, dampers, motors, etc. In many cases, the auxiliary was provided by one contractor, the control system by another, the switchboard by a third, and the cabling between them all by a fourth.

Where a contractor was fully responsible for an entire system, Commission Construction staff had to inspect the work and witness much of the commissioning to ensure compliance with the contract.

### ***Generation Group***

Most of Generation's professional, supervising, and operating staff took up duty during the late erection/early commissioning phase of the first unit. All early operating staff were from other Commission power stations and had only to complete a 13-week station training school before commencing operating duties.

When the plant had been commissioned, it was handed over to the Generation Group. On handover, the Generation Group became responsible for the plant's operation and carrying out any defect and routine maintenance.

### ***Contractors***

There were approximately 75 contractors engaged under about 120 contracts. Each contractor was responsible for the erection and commissioning of the plant in their supply. The contractor was also responsible for any subcontractors employed under the contract, regardless of whether the subcontractor was nominated by the Commission.

### ***Programs***

EC Construction staff prepared the Broad Commissioning Program for each unit on-site. This was a critical path program detailing all major plant commissioning activities to be completed to meet the unit's project dates. This program formed the base working document for the coordination of all commissioning.

Contractors were required to submit detailed erection and commissioning programs for the plant under their supply. These programs formed a basis for measuring a contractor's monthly progress. They were also used by Commission construction staff to coordinate the work of other contractors.

Separate detailed programs were prepared for each system on each unit. These systems were mainly based on major plant items, such as boilers or coordinated control systems, and were in the form of a critical path program. Construction staff produced these programs on-site. Each program usually involved plant provided by several contractors. The programs were used by construction staff to coordinate erection and commissioning activities in detail.

Construction staff prepared a monthly commissioning program. It covered the major commissioning planned for the following two months on a weekly basis. The program was divided into major plant or systems corresponding to the systems program. This way, systems programs could be updated, and the overall commissioning could be coordinated monthly.

In the early stages of the power station's commissioning, a weekly program was prepared by construction staff, listing all commissioning activities on a planned daily basis for the coming week. This program was developed at a joint meeting of all major plant contractors, commissioning engineers, and selected Commission site staff. This program provided the final written coordination of the main commissioning activities for each unit.

As the commissioning accelerated, the meetings were held twice weekly. About the time boiler-turbine operations occurred, the meeting was held daily (Monday to Friday), and the program was issued. This program provided the final written coordination of the main commissioning activities.

The Daily Operating Instruction (DOI) was issued by Generation to advise operating staff and other staff of all matters that affected the day-to-day operation of the power station.

### ***Commissioning Supervision and Coordination***

Each contractor was responsible for commissioning the plant in their supply. However, the Electricity Commission's responsibility was the overall coordination of the plant commissioning provided by several contractors.

One method employed by EC Construction staff to coordinate the unit's commissioning was through the provision of duty engineers and duty inspectors. These were drawn from EC Construction staff and worked shifts as required. When not needed for duty coverage, they carried out their regular duties of site contract supervision.

Over and above the coverage provided by Construction's duty engineers and inspectors, the Generation group provided a full complement of operators around the clock. In addition, each EC Construction engineer and inspector was responsible for ensuring the contractors met their contractual obligations in both the direction and commissioning of the plant in their supply.

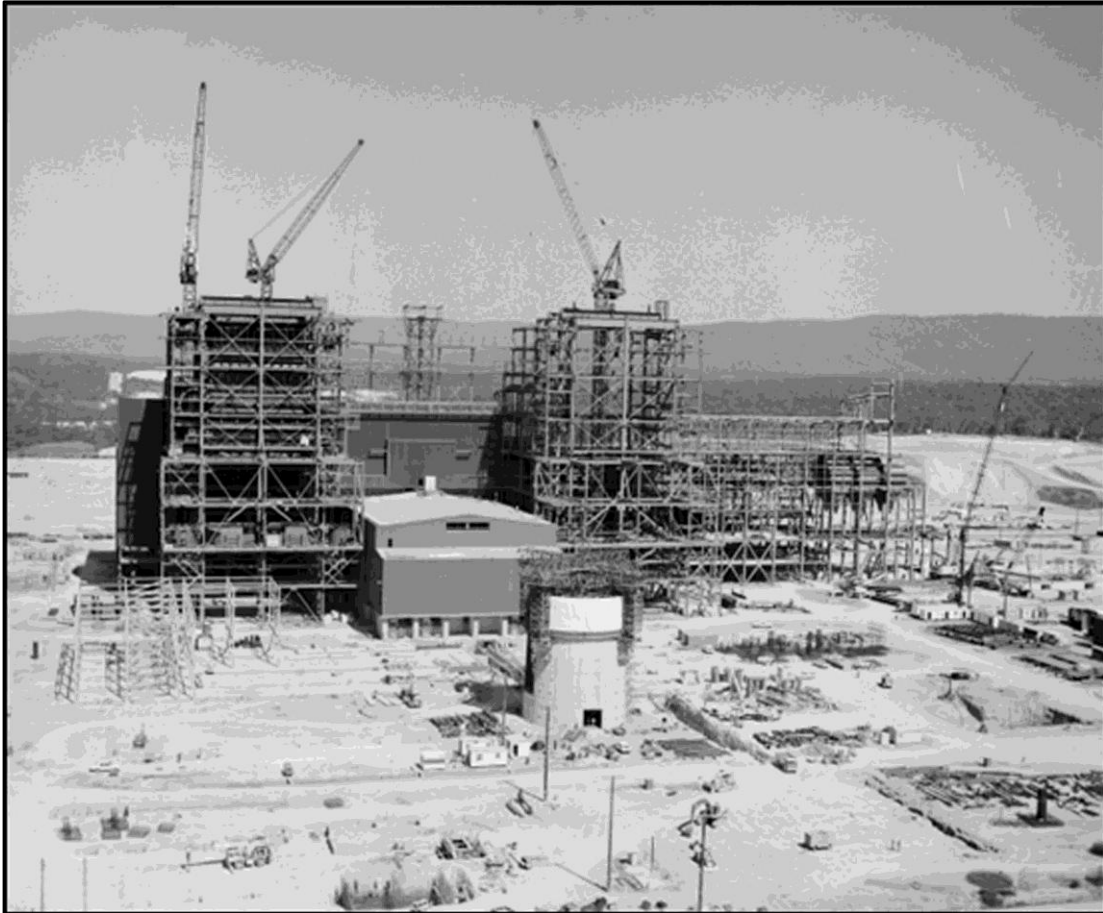


*Figure 43 Units 1 and 2 under construction in 1980  
(ECNSW 013284)*

### ***Pre-Synchronising Commissioning History***

As Unit 1 was the first unit to be commissioned, its commissioning involved placing a significant portion of the station plant in service.

### ***Power Supplies***

Initial erection work was carried out on temporary construction power supplies, which were gradually phased out of service as each unit's erection was completed. Commissioning began with checking the DC supplies required for control, protection, and alarms. This commissioning was carried out by EC staff. Permanent station power supplies were then placed in service. These were provided from two 33kV/11kV (30MVA) Station Transformers fed from a 132kV/33kV switchyard. This station supply enabled the initial commissioning and operation of major Unit 1 auxiliaries.

### *Major Station Plant*

The Broad Commissioning Program for Unit 1 dictated which major station plant was required to be operational to enable orderly commissioning of the main boiler-turbine unit. The main station plant, together with their initial operation dates, were:

- Permanent Fire Services Plant - February 1981
- Station Air Compressors - March 1981
- Ash and Dust Plant - June 1981
- Coal Handling Plant - June 1981
- 330kV Switchyard - June 1981
- Demineralised Water Plant - June/July 1981
- Domestic Water System - July/August 1981
- Emergency Diesel Generator - October 1981
- Circulating Water System - October/November 1981

The above dates only indicate when the station plant was first placed in service, often on a very limited scale but sufficient to meet the requirements of the main unit commissioning. The above plant was often split into two portions - one for units one and two and the second for units three and four. The second portion of each item of station plant was commissioned to meet the requirements of unit three.

### *Main Boiler Turbine Plant*

The critical path for unit one main plant was the boiler. Various erection delays prevented the commencement of significant boiler commissioning until August 1981, when boiler airflow testing commenced. Before this, the boiler had been hydrostatically tested (December 1980), and the main draft fans had been tested through May/June 1981.

Once the critical path was commenced with boiler airflow testing, the commissioning followed smoothly and on program until it was disrupted in December 1981 by a series of bans and strikes by electricians employed by the various contractors.

### *Problems Encountered in Pre-Commissioning*

#### *Erection Delays*

Traditionally, erection problems have delayed the commissioning of a power station's first unit. Successful efforts were made by the Projects Group/Construction Branch to overcome these problems, especially in civil works. Programming played an important part in minimising these delays and their effects.

#### *Temporary Demin Plant*

The main demineralising plant could not provide demin water for Unit 1's boiler hydrostatic test in December 1980. At previous stations, demin water had been supplied by tankers. This was not feasible at Eraring due to the high water requirements. Accordingly, a temporary demineralising plant was procured, and approximately four megalitres of demin water were produced to meet the boiler requirements.

#### *Air Compressors Auxiliary Cooling Water*

Delays in the completion of the Auxiliary Cooling Water system necessitated the provision of a once-through cooling water system for the commissioning and initial operation of the station air compressors. These were initially required to be in service for the commissioning and operation of the demineralising plant.

### Ash & Dust Plant

The nature of the boiler chemical clean necessitated the operation of the Ash Plant to dispose of the contaminated boiler water/chemicals to the Ash Dam. The Ash Plant's erection and initial commissioning were accelerated sufficiently early enough to meet the boiler chemical clean requirements.

### Boiler Fuel Oil Supply

Failure of the fuel oil supply lines during initial testing resulted in the need to hire a 30,000-litre fuel oil tanker to meet the boiler test fire date. This tanker was parked adjacent to the fuel oil pumps and provided fuel oil for initial flushing and boiler firing. The tanker was maintained full by operating a shuttle service with a smaller tanker from the main fuel oil tanks throughout the chemical cleaning of Unit 1 boiler.

### Circulating Water Pumps

Failure of the anti-runback device on the 'B' CW pump and industrial action by various groups placed the unit operations in jeopardy. However, careful operation of the pump and accelerated erection of the second and third pumps resulted in minimal delay to the program.

### Fire Protection

A prolonged strike of approximately twelve months by Sprinkler Fitters prevented much of Unit 1's fire protection from being installed. The Commission organised, trained, and equipped a fire team to provide round-the-clock coverage of the unit until the permanent fire systems could be placed in service.

### Industrial

Bans and strikes by several groups had some effect on the erection of Unit 1. However, industrial action by electricians employed by contractors significantly affected the commissioning of the Unit.

The industrial action by the electricians commenced on Unit 1 in October 1981. Had this action not occurred, Unit 1 would have been synchronised toward the end of December 1981.

This industrial action culminated in a 10-week strike by electricians that did not end until 15 March 1982. Unit 1 was synchronised one week later, on 22 March 1982.

During the industrial action, some commissioning was carried out. Electricians' brief return to work enabled two mills (F and G) to be tested using the turbine bypass system well before synchronising the unit.

However, the electricians' strike prevented the unit's final pre-synchronising checks, commissioning of the remaining mills, and commissioning of both steam feed pumps and the backup cooling water pumps. These activities were planned for the pre-synchronising period. Carrying out these commissioning activities became necessary after synchronising with the unit in service.

### *Summary*

Despite many problems and delays mainly associated with erection work and industrial action, the pre-synchronising commissioning of Unit 1 went particularly well. This is a notable achievement considering the vast scope and complexity of Eraring Power Station and Unit 1 in particular and the huge number of persons, both contractors and EC staff, involved in the work. No significant plant or coordination problems occurred in this period.

More than anything else, the thoroughness of the checking and commissioning in this pre-synchronising period contributed significantly to the record post-synchronising loading and commissioning of Unit 1.

### *Unit 1 Post-Synchronising Commissioning*

The post-synchronising commissioning history of Unit 1 is summarised in graphical format in Figure 44. The unit reached full load (660 MW) twenty-nine days after synchronising—a record performance for a first unit. An overload capacity of 700 MW was successfully tested on day 31.

#### *Initial Loading*

The initial loading of the unit was relatively rapid, with the first mill ('F' mill) being placed in service the day the unit was synchronised. 'G' mill followed the very next day. This was made possible by using the Main Turbine Bypass System to commission these two mills before synchronising the unit. The speed with which the remaining five mills were commissioned determined the unit's loading program.

#### *Operating Experience*

During the commissioning period following unit synchronising, several unit trips occurred, providing opportunities to use the turbine bypass system for unit restarts. In all cases, the turbine was run up a few hours after tripping, so high main steam and reheat steam temperatures were required from the boiler to match the HP turbine and IP turbine inlet temperatures. With two mills in service and a steam flow of approx 15% CMR through the bypasses, the main steam and reheat steam temperatures were raised in about one hour to 500°C and 475°C, respectively, allowing restart of the turbines with little temperature mismatching. Initial reloading of the turbine can be quite rapid with minimal disturbance to the boiler as steam flow is transferred from the bypasses to the turbine. In the early post-commissioning period, the bypass system operated reliably, the only problem being a hydraulic control failure on one HP valve.

It is proposed that the turbine bypass be extended to assist in taking the unit out of service. The bypass would be placed in service at 30% CMR, providing a more controlled shutdown by allowing the turbine to be taken out of service, followed by the shutdown of the boiler. It is anticipated that the bypass system will be of significant benefit, particularly for two-shift operations by providing better control of startups, fast loading, and minimum life expenditure for the plant.

#### *Nine Trips*

Nine unit trips occurred in the thirty-two-day post-synchronising period. All could be described as typical "teething" type problems. In each case, the unit returned to service in a few hours.

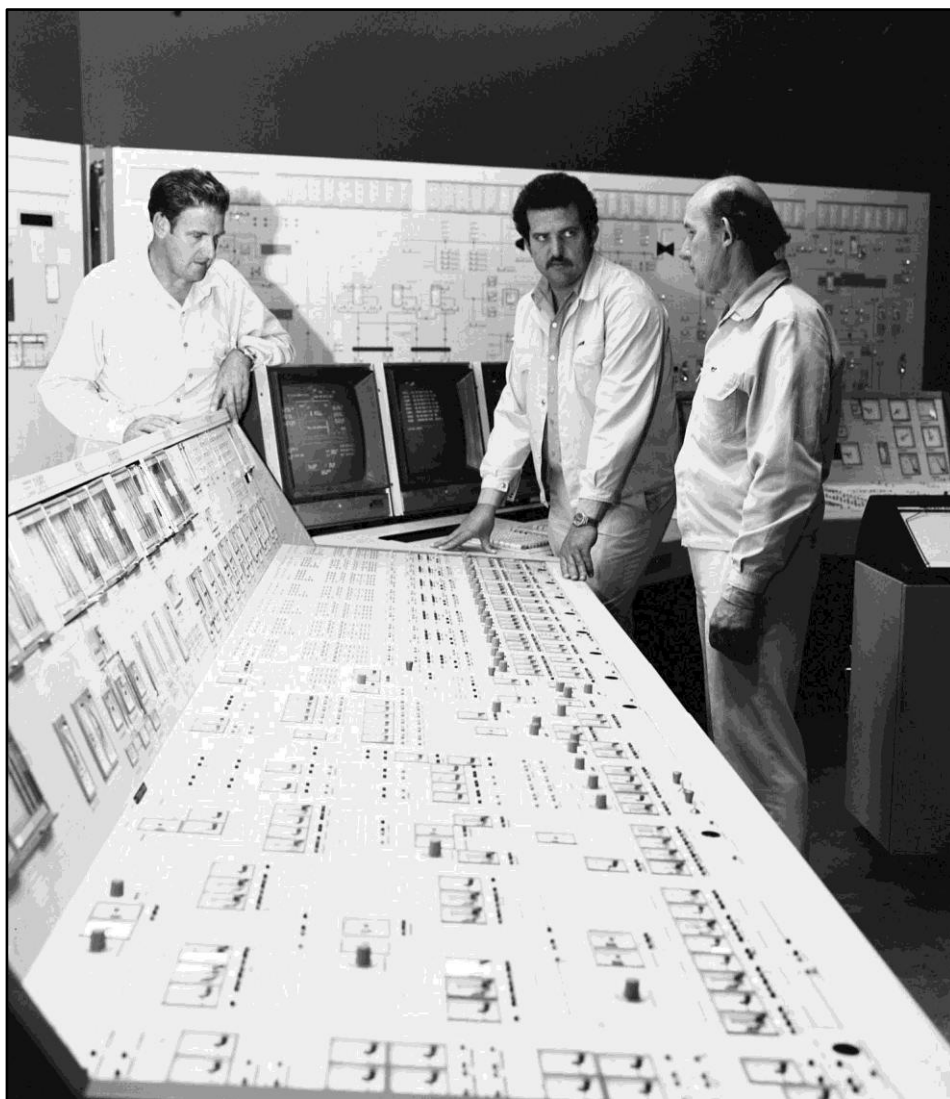


*Figure 44 Eraring Simulator, August 1981  
Jim Smith, Graeme Robinson, and Mal Ireland  
(ECNSW 13426)*

Figure 45 Initial Loading of Unit 1.

*It was taken to 700MW for a one-hour overload test 31 days after initial synchronisation.*

## Problems and Solutions

The major operational problems that have occurred on the main plant are as follows:

### Boiler

During cold startups, the "swelling" of the drum water level during the pressure-raising period from 0 - 1500 kPa caused the water level to rise beyond the range of the installed level instrumentation despite careful control and many changes to operating procedures. The swelling is believed to be caused by steaming in the economiser. The problem is yet to be resolved (1982/1983).

Oscillations in drum water level have occurred at normal water level as boiler pressure was raised for load pickup in the sliding pressure mode. Oscillation did not occur when drum water level was raised 50 mm above NW. The oscillations were believed to be due to differential feed flow to each drum because of insufficient flow resistance by the drum feed pipes. Also, because of the subcooling of water at the end of the drums, the actual drum water level was below the indicated level. Subsequent modifications to drum feed pipes have not eliminated the problem.

After synchronising, the raising of unit load was accompanied by increasing gas temperatures into the air heaters such that design temperatures were greatly exceeded. The problem was compounded by delays in commissioning the boiler soot blowers. Subsequent partial soot blowing has reduced the temperatures, but full availability of soot blowers is required before the full extent of the problem can be assessed.

In the pre-synchronising commissioning period, during tests associated with high cold air flows and high gas flows, pronounced vibration occurred in the boiler back passes, particularly in the region of the back pass gas dampers. Additional baffles were installed in the superheater pass and later in the reheater pass, and testing was to be carried out to determine whether the problem had been solved.

In the pre-synchronising commissioning period, poor combustion at ignitors caused soot buildup in boiler passes, air heaters, and fabric filter cells. Combustion has been improved by redesigning the burner tip and air tube and operating with the maximum available atomising air pressure. Combustion, however, with a cold furnace, still requires improvement.

### Turbo-Generator

Before synchronising, the generator hydrogen seals were found to be damaged, and the rotor shaft scored at the TE seal. Seal damage and the shaft scoring were believed to be caused by foreign material in the seal oil system despite extensive pre-commissioning oil flushing. The seal oil piping was acid-cleaned and oil-flushed. At the outage for removing steam strainers, an inspection of the hydrogen seals showed seal damage and shaft scoring at the SE seal. The seal oil piping was again acid cleaned and oil flushed.

### Summary

The record post-synchronising loading and commissioning of unit one proved a triumph for all concerned. This is especially true considering the extreme complexity of unit one and its control systems and the significant number of people involved, both contractors and EC staff. No significant plant problems were encountered. The small number of unit trips, all related to teething problems and the rapid loading of the unit, are directly due to the care, thoroughness, and professionalism of all staff associated with the project.

### *Takeover of Plant*

Plant was taken over from each contractor when its erection was complete, and it had passed "tests on completion." The main boiler and turbine plant takeover is normally arranged after initial synchronising. Once the plant is taken over, the Commission becomes responsible for its normal operation. However, on the main boiler and turbine plant, there is usually a period following the takeover in which the contractor is responsible for technical supervision of operations.

The date of takeover normally defines the commencement of the maintenance period. During this maintenance period, the contractor is responsible for all repairs and maintenance resulting from plant defects. Routine maintenance is, however, the responsibility of the Commission. The maintenance period is typically twelve months but may be longer on some contracts and plants, e.g., the mills, though part of the boiler contract was covered for two years of on-load operation.

Due to delays caused by industrial action, the turbine contract on Unit 1 was taken over in December 1981, and the boiler contract on Unit 1 was taken over in February 1982. Unit 1 was synchronised on 22 March 1982.

### *Future Commissioning Work*

Though most of the commissioning work on Unit 1 had been completed when it reached full output, some additional work remained following the unit's return to service after its "Steam Strainer Outage." This includes the following:

- Boiler burner adjustment to reduce NOX emissions - estimated two weeks at full load.
- Fine-tuning of the main boiler/turbine control systems.
- Runback testing involving deliberate tripping of main plant auxiliaries to test the unit and its control systems' ability to safely unload to a satisfactory target load without tripping.
- Mill performance testing.
- Boiler performance testing.
- Turbine performance (heat rate) testing.

### *Conclusion*

The commissioning and initial operation of Unit 1 at Eraring was a well-earned triumph for all concerned. As a model for future units, it only requires minor refinements to ensure even greater commissioning performance. The high degree of teamwork, cooperation, and professionalism of contractors and Commission staff cannot be over-emphasised—all parties worked as one to achieve the common goal. Contractors and Commission staff involved in the project had reason for feeling justifiably proud of Unit 1's commissioning.



*Figure 46 Polishing Plant, January 2025  
(Ken Thornton)*



*Figure 47 Coal Conveyors  
(ECNSW)*

## CHAPTER 5 TECHNOLOGICAL EVOLUTION

In 1985, the ECNSW submitted an application for an Engineering Excellence Award from the Institution of Engineers, Australia.<sup>22</sup> This submission highlighted the significance of Eraring, which was commissioned to address the expected surge in the state's energy demands throughout the 1980s and beyond.

The submission emphasised the thoughtfully chosen location of the power station, situated discreetly within a natural depression on the western shore of Lake Macquarie. This selection ensured the station blended with its surroundings and minimised potential visual impact.

Constructed at a considerable cost of \$1.65 billion (1985), Eraring's original configuration comprised four generating units, each with a capacity of 660 MW.

### General description<sup>23</sup>

In the early 1980s, the broad objectives of the Eraring project were:

- Construct and run the plant in a way that creates low-cost energy using responsible resource management.
- Employ the most up-to-date and efficient technology for generation and transmission.
- Incorporate new features not found in earlier Electricity Commission power stations. Several of these features were engineered due to environmental considerations. Others resulted from developments in power station technology directed at improved efficiency, availability, reliability, and ease of maintenance.
- Provide the plant with high flexibility for load following and the ability to stop and restart frequently.
- Maintain environmental conditions as undisturbed as possible. This necessitated being mindful of the biological conditions in the lake and adjacent areas by limiting water temperature and impurities discharged into the lake, dust emission, nitrogen oxides in the gases released into the atmosphere, and noise limitation at the boundary and within the power station.

Twenty-nine years later, in 2014, the station had undergone many changes, the principal ones being an upgrade to the main control systems, and the electrical output of each of the four turbine-generator units increased from 660 MW to 720 MW, with a combined capacity of 2,880 MW.

The first turbo-alternator was brought online in 1982, followed by the second and third units in 1983, and the fourth in 1984.

The plant comprises four similar and independent coal-fired units, each comprising:

- One natural circulation coal-fired boiler was manufactured by IHI under license from the Foster Wheeler Energy Corporation. Maximum steaming capacity is 594.9 kg/s at 540°C and 265 bar pressure.
- One triple-pressure steam turbine manufactured by Toshiba, comprising a single-flow HP cylinder with nine stages of blading, a double-flow IP cylinder with eight stages of blading, and two double-flow LP cylinders, each with six stages of blading.
- Associated plant equipment includes:
  - Pulverised fuel milling plant and fans for combustion
  - Bag filters for the capture of particulate emissions
- Four 330 kV and two 500 kV transmission lines provide a secure and reliable grid connection.

The generating capacity of each of the four turbines was upgraded from the original output of 660 MW to 720 MW between 2011 and 2012.

After completing each generating unit's capacity upgrade, Eraring was positioned to provide reliable operation with moderate maintenance programs for an extended life to 2034 or later. (These projections were amended in February 2022 with an announcement that the station could potentially close in 2025. This date was further amended to 2027 and possibly 2029 via an agreement with the NSW State Government.)

Saltwater from Lake Macquarie is used for cooling and is supplied through a concrete tunnel that passes under Dora Creek and up to the station via an open canal. As part of the recent plant upgrade, a large retention basin was installed to allow the temperature of the water in the outfall canal to be moderated during periods of high ambient lake temperatures, which can occur from time to time in summer.

Reclaimed sewage water from the Dora Creek Waste Water Treatment Works is heavily purified and used to generate steam for the turbines instead of using municipal potable water supplies. Saltwater helps cool the superheated steam and moderates the temperature of the outlet water to minimise pollution.

The coal comes from five mines in the local area and is delivered by conveyor, rail, and private road. There is significant coal storage capacity on-site. Eraring Power Station employs a fabric filter system of dust collection in which particulate emissions from coal combustion are captured instead of released into the atmosphere.

## **Coal handling plant**

Prior to the 720 MW upgrade, the station consumed over 24,000 tonnes of coal daily, with four units operating at full load.<sup>24</sup> Since then, daily usage has been up to 31,500 tonnes. In the early years, this coal was obtained from two captive mines, Myuna and Cooranbong, via conveyor belts. More recently, it was also obtained from Awaba and Newstan Collieries by trucking on private haul roads. Coal is also delivered via rail.

Coal can be conveyed directly to the boiler bunkers or into the Main Receiving Bin and onto either dry live storage (30,000 tonnes), the Stacker-Reclaimer area (200,000 tonnes), or long-term storage (1,500,000 tonnes). Mobile plant equipment is used to spread, compact, and recover coal from the storage area.



*Figure 48 Coal Stacker/Reclaimer*



*Figure 49 Coal Stack, May 1984  
(ECNSW CT7,0003)*



*Figure 50 Alan Williams working on the Stacker Reclaimer  
(ECNSW)*

## Boiler Operations

From the boiler bunkers, coal is fed via Coal Feeders into the pressurised ball mills for pulverisation. There are seven Pulverised Fuel (PF) mills per boiler.

The boilers are twin-drum, natural circulation, balanced draft, front and rear firing burners with a divided back pass, and are designed for variable pressure operation. Steam is generated at 16.5 MPa, at a nominal rate of 560 kg/s, with superheat and reheat temperatures of 540°C/540°C. Temperature control is achieved by a three-stage desuperheater for the superheated steam, gas damper control, and steam bypass (for fine-tuning) for the reheated steam.

The draft plant includes two variable pitch axial flow Forced Draft Fans, two centrifugal Primary Air Fans, and two mixed flow axial Induced Draft Fans.

## Air Heaters

Combustion gases are cleaned of fly ash in the Fabric Filter dust collecting plant and finally discharged to the atmosphere through a 200-meter stack.

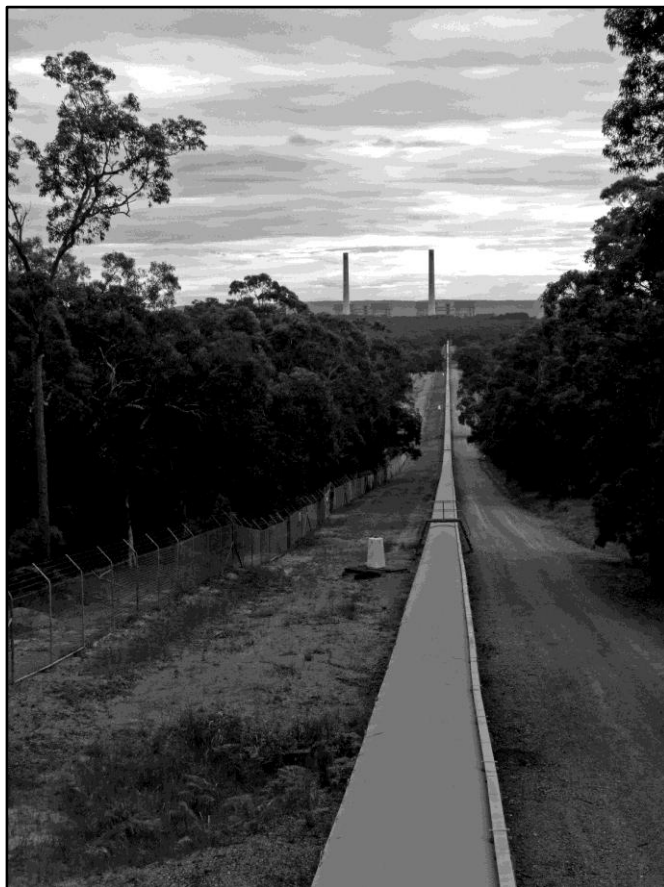


*Figure 51 Coal conveyor from Myuna Colliery, March 2007  
(Ken Thornton)*

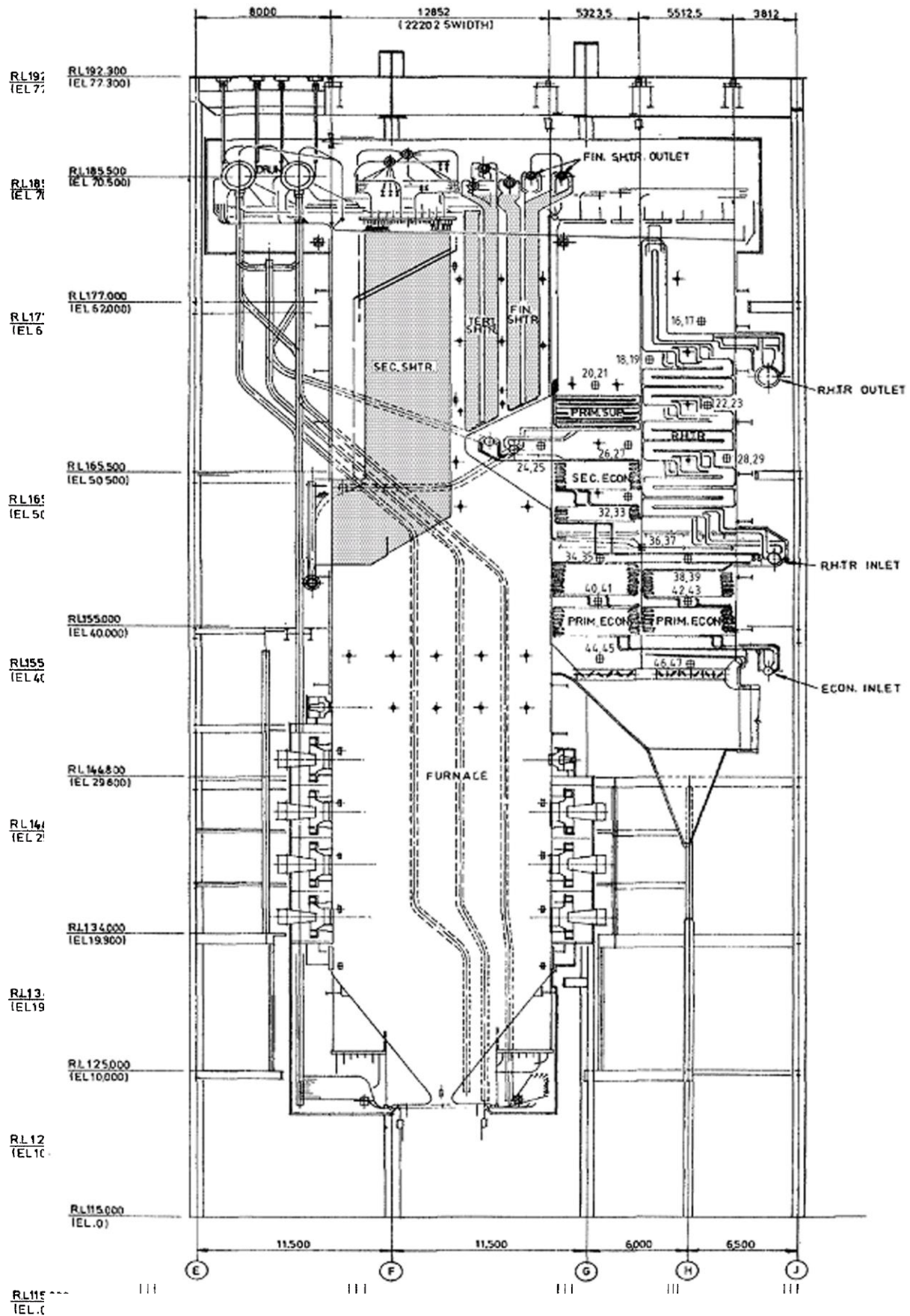


Figure 52 Boiler side elevation prior to 720/750 MW upgrade  
(ECNSW)

## Ball Mills

Vertical spindle mills for pulverising coal were used in previous large power stations. Horizontal ball mills were adopted at Eraring and have provided good operational performance, including:

- Constant fineness, regardless of the length of service
- Better fineness at partial load
- High availability and low labour maintenance
- Large reserve capacity with increased operating stability

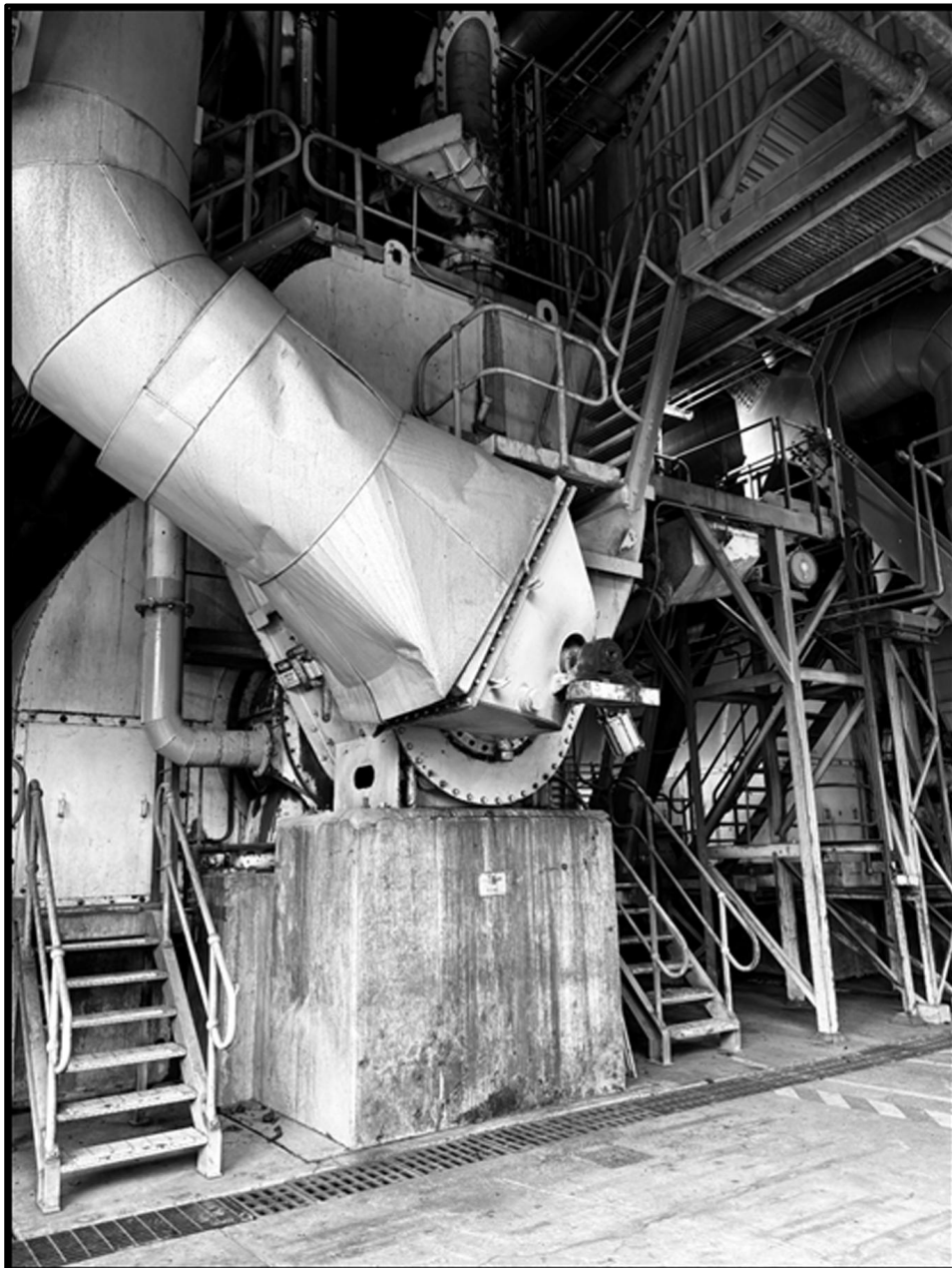


*Figure 53 Pulverising Fuel Ball Mill, November 2024  
(Ken Thornton)*

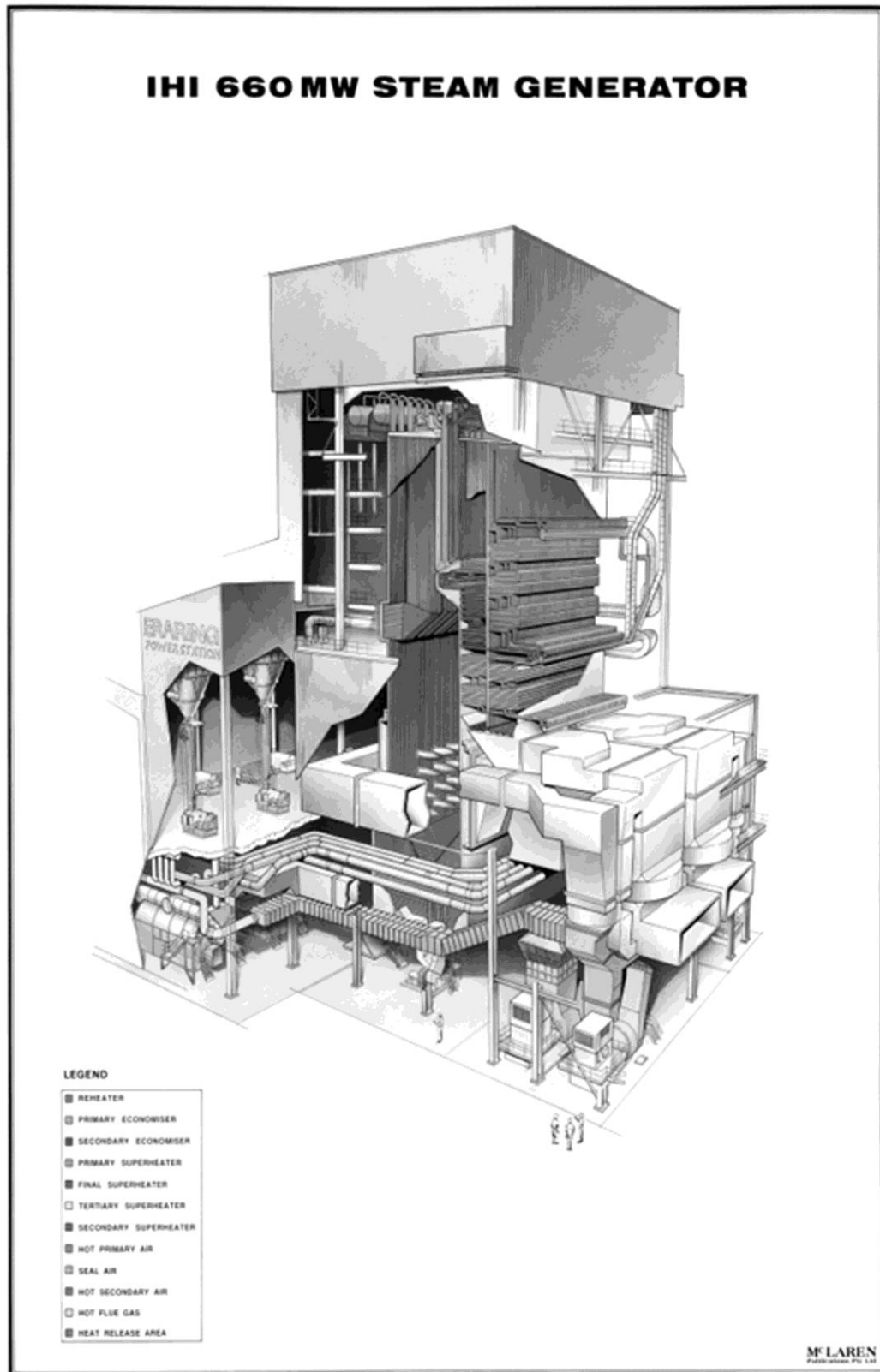


Figure 54 IHI 660 MW Steam Generator, McLaren

## Fabric Filters

The ECNSW had been carrying out a development program with fabric filters for many years. Past ECNSW practice utilised electrostatic precipitators to collect fly ash. Precipitator output had been variable, depending on coal quality and plant condition, which tended to increase with time. Following successful trials of retrofitted fabric filters at Wangi and Tallawarra, the decision was taken to install them at Eraring. A shaker-cleaned plant utilising acrylic fabric as the filtering medium was selected. When the order was placed, this was the most significant order for fabric filters worldwide and the only major plant to use the shaker method of cleaning with acrylic bags.

The Fabric Filter dust-collecting plant is one of Eraring's technological features. The plant for each boiler has 40 separate cells containing 47,360 acrylic bags. Flue gas entering the Fabric Filter is controlled to 120°C by the admission of attemperating air to maintain maximum bag life. Emergency water sprays protect the bags should the gas temperature reach 150°C.



*Figure 55 Fabric Filters, November 2024  
(Ken Thornton)*

## Ash and dust

The Ash Handling Plant collects furnace ash and economizer grits, conveying them to the ash disposal area as a slurry. The original Dust Plant extracted the fly ash from the Fabric Filter plant and conveyed it to the ash disposal area as a slurry.

In recent years, the Coal Combustion Plant conveying systems were commissioned to automatically remove ash as it is produced from the flue gas cleaning process on each boiler unit into storage for removal from site.

## Turbogenerator and Turbine

The superheated steam generated in the boiler is fed through the Turbine Stop and Throttle Valves to the turbine, where it expands through the High-Pressure cylinder. The steam is then returned to the boiler for reheating, admitted via the combined emergency and interceptor valves to the turbine's Intermediate-Pressure and Low-Pressure cylinders, and discharged to the Condenser.

The turbine is a tandem compound reheat machine with a single flow high pressure, double-flow Intermediate and two double-flow Low-Pressure exhaust cylinders.



*Figure 56 Turbine Generator, March 1982  
(ECNSW 13504)*

## *Turbine Bypass System*

The most critical factor in a conventional turbine and boiler unit's start-up operation is to reduce the turbine parts' thermal stress by closely matching the superheat and reheat steam temperatures to the corresponding HP and IP turbine metal temperatures.

The HP turbine bypass system enables the diversion of steam from the boiler superheater to bypass the HP turbine and enter the cold reheat line. Similarly, the LP turbine bypass system allows steam from the boiler reheater to bypass the IP and LP turbine stages and enter the condenser.

These turbine bypass systems play a crucial role in various aspects of power plant operations, including:

- Temperature matching between the boiler and turbine during hot and warm starts
- Facilitating low-load operations, such as two-shifting
- Allowing the boiler to remain in service during short-term turbine outages
- Assisting in grinding out full mills after the unit has desynchronized for outages

It is important to note that the turbine bypass at Eraring was not designed to keep the boiler in service following a turbine trip from full load.

In the HP turbine bypass system, four HP steam bypass valves are located upstream of each of the four HP turbine stop valves. These valves are carefully controlled to maintain the main steam pressure at a predetermined value, typically around 8 MPa. The discharge from the HP bypass valves is directed into the cold reheat lines.

Similarly, the LP turbine bypass system incorporates four LP steam bypass valves upstream of each IP turbine combined interceptor and emergency valve. These valves are also under precise control to maintain the reheater steam pressure at a specific value, which varies with the turbine load. A minimum value, typically around 1.1 MPa, is enforced at low loads. The LP bypass valves discharge the steam into the condenser.

Each HP bypass valve is accompanied by a spray or attemperating valve, which regulates high-pressure feed water to achieve the desired steam temperature upon entering the cold reheat line. With the LP bypass valves, attemperating water is sourced from the condensate system.

In ECNSW power stations before Eraring, boiler start-up steam conditions were manually adjusted by overfiring oil burners and discharging significant volumes of condensate and steam as waste. These techniques posed challenges for control, leading to unpredictable interruptions in the planned start-up sequence and increased consumption of demineralized water and fuel oil. Such interruptions negatively affected the overall availability of steam-driven plants.

During Eraring's initial unit commissioning operations, the bypass system was found to have additional environmental and economic benefits. By redirecting the mini-blow of the boiler and steam piping directly to the condenser instead of the atmosphere, the excessive noise typically associated with this process was eliminated, resulting in savings by shortening the overall commissioning program.

## Cooling Water System



*Figure 57 Cooling water caisson being floated into place before being sunk into a trench in Dora Creek, January 1980  
(ECNSW)*

The cooling water for steam condensation (main turbine and steam feed pump condensers) is drawn from Bonnell's Bay. It passes under Dora Creek through a concrete tunnel (caisson) and then an open canal. The design and construction of the 4-cell, 361-meter-long conduit was unique in Australia, as was its controlled floating and subsequent sinking onto prepared bedding in a trench across Dora Creek.

It is then filtered by rotating screens and lifted by pumps to a high-level canal. Each of the six pumps can service one turbogenerator at full load. Water is siphoned off and piped to each condenser from the high-level canal. The spare pumps provide additional water, which bypasses the power station condensers to reduce the circulating water discharge temperature into the lake under extreme conditions. With increased discharge temperature due to increased station output from 2010, water from the Attemperating Dam can partly offset the increase.

Water is then discharged to the outfall canal, drops through a shaft spillway into a tunnel and open canal, and is discharged into Myuna Bay. The initial design for the connection between the high-level canal and the outfall canal featured a straightforward concrete overflow/spillway.<sup>25</sup> As expected, water surged out with considerable speed. To mitigate this, large rocks were positioned to disrupt the water's momentum. However, this solution introduced a new challenge:- spray. Under north-easterly winds, the mist drifted into the nearby high-voltage switchyard. The initial fix involved setting up a plastic cover. This was later substituted with concrete slabs, offering a more durable solution.

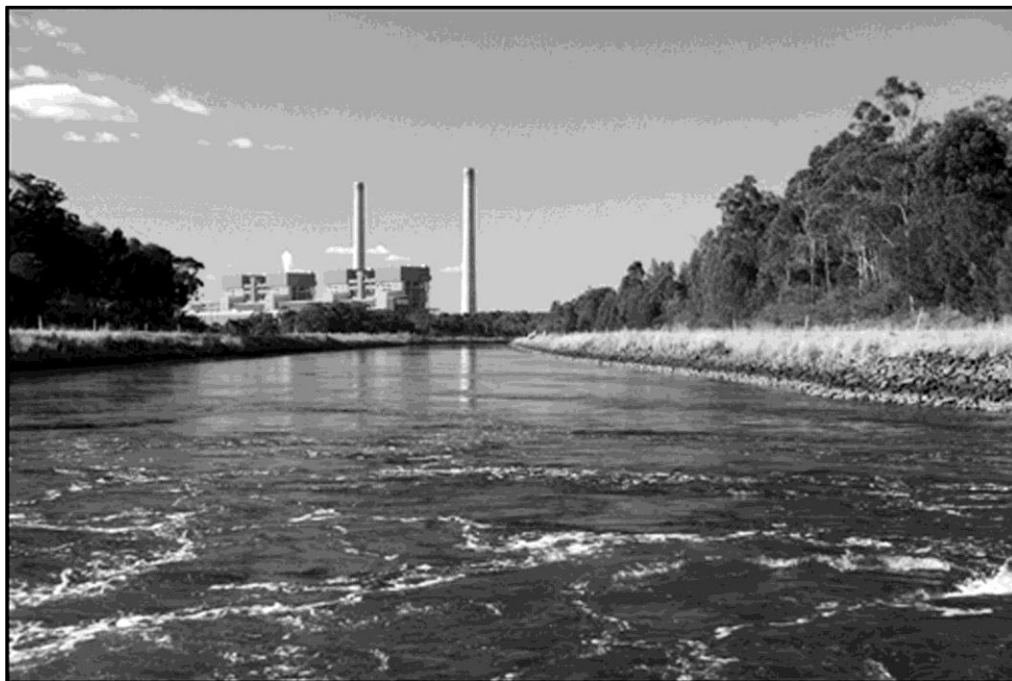


*Figure 58 High-Level Canal  
(Origin Energy)*



*Figure 59 High-Level Canal overflowing, October 2024  
(Ken Thornton)*



*Figure 60 Cooling Water from the High-Level Canal to the Main Condensers, November 2024  
(Ken Thornton)*

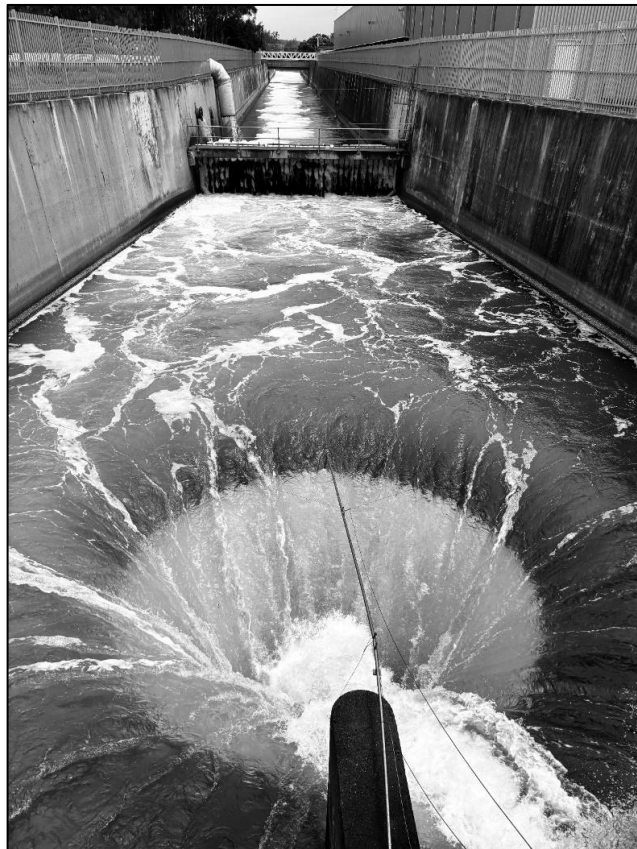


*Figure 61 Cooling Water Outlet Canal discharging into the tunnel to Myuna Bay, December 2024  
(Ken Thornton)*

### ***Taprogee – online condenser tube cleaning***

This system cleans the main condenser tubes' internal bore and inhibits fouling by scale, slime, suspended solids, and corrosion. This system is installed on each half-condenser cooling water circuit. It comprises sponge rubber ball injection and extraction equipment, allowing oversized spherical sponge rubber balls to be continuously forced through the condenser tubes by the water flow.

The traditional method of injecting chlorine into the cooling water inlet pipelines to control marine growth has been avoided. Flow reversal valves and inlet strainers have been provided in each half-condenser to enable the cooling water flow through each condenser to be periodically reversed with the unit in service. This feature has successfully prevented the growth of weeds, mussels, and other biological organisms in the inlet pipelines and condenser tubes by exposing them to periodic reversals of high-temperature outlet cooling water.

### ***Fresh Water***

Power stations such as Eraring use large quantities of domestic water as feed to water demineralising plants, which produce pure water for boiler make-up.<sup>26</sup> In addition, fresh water is used in specialised cooling and general domestic and fire service applications. Until the mid-1990s, fresh water was obtained from the Hunter District Water Board and stored in two 75 million litre tanks. The daily use of fresh water is in the order of 7.4 million litres.

Water from Hunter Water operates on a user-pay system; hence, the water used is charged. Minimising water usage can offer considerable annual cost savings. Alternate sources of supply can provide additional cost benefits.

An alternate supply was available to Eraring.<sup>27</sup> Hunter Water had built a new secondary treatment plant at Dora Creek on the western side of Lake Macquarie, not far from Eraring. The discharge from this plant was to pass the power station and eventually be discharged to a deep ocean outfall on the eastern side of Lake Macquarie.

Secondary treated effluent is unsuitable for power stations without some form of treatment. Several quality issues must be addressed. The water requires disinfection and the removal of organic matter, at the least. The total dissolved solids may need some form of pre-treatment to reduce these, depending on the source of the feed water to the sewage plant.

The Water Reclamation Plant (WRP) was commissioned in March 1995.<sup>28</sup> Here, microfiltration and reverse osmosis technologies process 4.69 million litres to produce 3.75 million litres of reclaimed water. Eraring was the first in the world to generate electricity using ultra-pure boiler waste recycled from secondary sewage effluent. The plant has received many national and international technology awards for innovation and environmental considerations.

From Hunter Water's perspective, it was planned that when the population connected to their Dora Creek facility expanded and effluent production increased beyond Eraring's requirements, a pipeline would later be constructed to pump excess effluent to the Belmont Ocean Outfall.<sup>29</sup> This pipeline was commissioned in 2010, allowing excess effluent to be pumped onto the Toronto Waste Water Treatment Works and then delivered to the Belmont Ocean Outfall via the submarine crossing of Lake Macquarie. In recent years, Eraring has received approximately half of all effluent produced by the Dora Creek facility.

## Electrical Systems

The unit's electrical system provides the necessary voltages for various auxiliary equipment used within the power station. This includes 11 kV motor-driven auxiliaries and transformers that support the 3.3 kV and 415 V systems.

The 11 kV and 3.3 kV switchboards are located in different areas within the basement of the Electrical Services Building (ESB). Some selected Station and Unit 415 V Switchboards can be found on the Mezzanine level of the ESB, while DC distribution Switchboards are positioned on Level 4 above the Control Room.

Each 11 kV unit board receives its power from two unit transformers (23/11 kV) in the generator transformer bay and is directly connected to the Generator Transformers via the Phase Isolated Bus (P.I.B.).

The unit's 11 kV board is divided into three sections, labelled A, B, and C, to allow for a separate power supply to plant equipment with multiple auxiliaries, such as the boiler draft plant. Single auxiliaries like the C.W. and electric feed pumps receive power from the central "B" section. This design ensures that the unit remains operational at approximately 60% capacity following the loss of either switchboard section. The 3.3 kV and 415 V unit auxiliary systems also originate from the 11 kV Unit board.

Each Unit Switchboard is interconnected with an 11 kV Station Switchboard to enhance operational flexibility and maintenance, particularly during outage periods when unit supplies are isolated.

The 3.3 kV unit system provides a reticulation system for 3.3 kV HV Unit/Station auxiliaries, such as the Main Turbine Aux Oil pump, Mill motors, Station Air Compressors, and Auxiliary Cooling Water pump motors.

The 3.3 kV Switchboard configuration follows a similar concept to the 11 kV unit switchboard, with A, B, and C bus sections. The power supply is derived from two 11/3.3 kV transformers connected to the A and C sections of the 11 kV unit board. Each 11/3.3 kV transformer can carry the entire load of the 3.3 kV unit switchboard.

The station electrical system supplies power to the 11 kV motor-driven station auxiliaries and transformers that support the 3.3 kV and 415 V station reticulation systems.

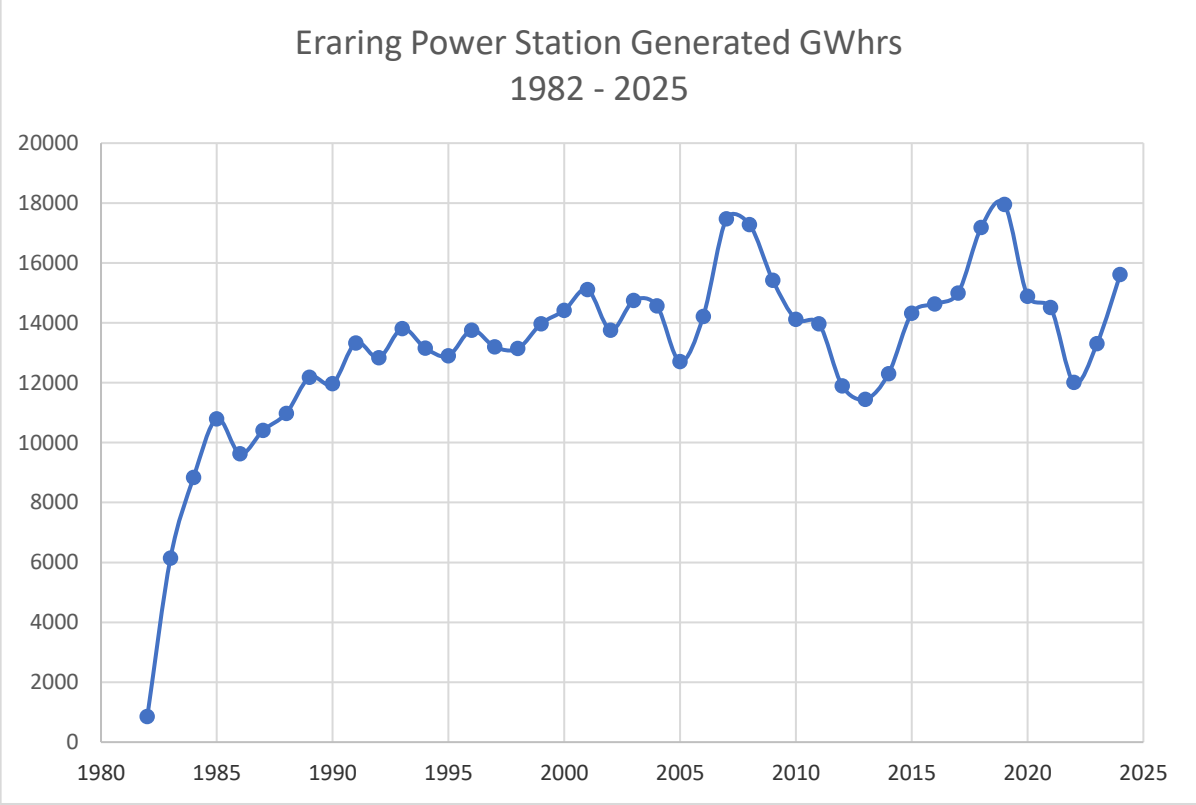


*Figure 62 Steam pipes to and from boiler, 2023  
(Ken Thornton ??)*



# CHAPTER 6 OPERATIONAL PERFORMANCE

## The statistics



Sources: ECNSW, Pacific Power, Eraring Energy, Origin Energy  
(Peter Lyons 2025)

### NOTES

|   |                 |                                                        |
|---|-----------------|--------------------------------------------------------|
| : | FY05            | ICMS Outages                                           |
|   |                 | Widespread Drought across NEM had EPS Running High     |
|   | FY07, 08        | Output Factors                                         |
|   | FY09-FY12       | Unit Capacity Upgrade Outages                          |
|   | FY12, FY13      | U4 Boiler Failure, 2B Gen Tx Failure, Forced Outages   |
|   | FY18, FY19      | Record Generation years for Origin - Market Conditions |
|   | FY81 to FY12    | Govt Ownership                                         |
|   | FY13 to present | Origin Energy Ownership                                |
|   | post 2021       | 5-year major outage cycle for units                    |

Across the Attemperating Dam  
(Origin Energy)



*Figure 63 Ash and Dust slurry pipes  
(ECNSW)*



*Figure 64 Mike Melidonis and Ralph Watts, at the synchronising of Unit 4 April 1984  
(ECNSW 13758)*



*Figure 65 Neil Harvey and others relocating a Green Turtle from the Inlet Canal  
(Eraring Energy)*

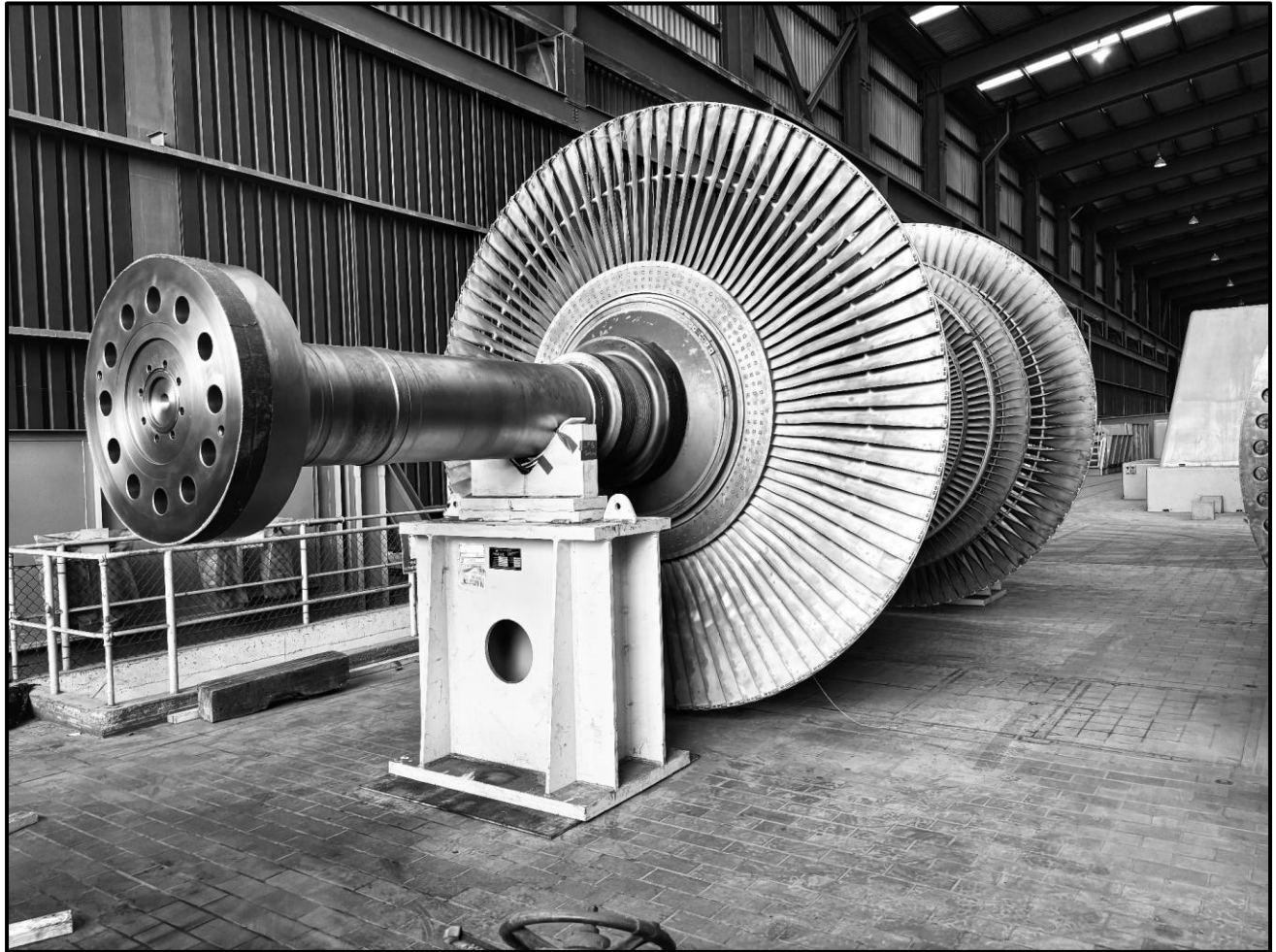


*Figure 66 LP Turbine rotor, November 2024  
(Ken Thornton)*



*Figure 67 330kV transmission line, May 1969  
(ECNSW CT9.0028A)*

## Trading Electricity: A Historical Perspective<sup>30</sup>

From interviews with Methsiri Aratchige (Compliance and Operational Markets Manager - Origin) and Stu Dunwoodie (Power Plant Operator – Origin)

### Before Privatisation:

During the Electricity Commission and Pacific Power era, the System Control Division, based in Carlingford in Sydney's northwest, managed the statewide electricity network. This division was responsible for dispatching the output of each power station's generating units in the most cost-effective order.

The control room at the Carlingford Centre was the nerve centre of this operation. It featured a massive mosaic diagram of the Commission's major supply system, spanning 25 meters of semi-circular wall space with 2.7-meter-high panels. A 10-meter-long panel was also dedicated to load dispatching, equipped with meters displaying the output of the Commission's primary power sources.

Before the 2013 privatisation, bulk power was supplied to county councils for distribution to retail customers. Power was also provided to the Department of Railways for traction, as well as to other government undertakings and a limited number of industrial enterprises.

With the establishment of the National Electricity Market (NEM) in the late 1990s, the high-voltage network expanded across five states and territories, including New South Wales. This development facilitated electricity trading among generators, wholesalers, and retailers.

### After Privatisation:

Electricity trading at Origin Energy is deeply intertwined with the broader history of Australia's energy sector, reflecting significant industry trends and shifts. Origin plays a crucial role in the energy market as a "GenTailer"—a company that generates and retails energy. Integrating Eraring's output into its retail operations highlights the strategic nature of Origin's business approach.

Historically, following the establishment of the NEM, electricity trading was straightforward. It involved bidding on energy production in 30-minute intervals before the day's operations, with financial settlements occurring every 30 minutes. This system, designed for stability and predictability, mirrored the technologies and market structures of the time. However, as the energy markets evolved, there was a shift towards a more dynamic system. Both bidding and settlements now occur in 5-minute intervals, driven by the need for greater efficiency and responsiveness, a change enabled by advances in Information Technology.

Eraring was designed with flexibility, mainly through its ability to "two-shift." This typically involved starting up generating units during periods of high electricity demand, like during the day or evening peaks, and shutting them down during periods of low demand, such as at night. However, the risks associated with restarting units after a shutdown often outweighed the benefits of this flexibility. By mid-2024, this led to adopting a revised low unit load as standard practice, a significant departure from the high loads typical of past daytime operations.

From an Eraring PPO's perspective, bid changes come through the Energy Dispatch Schedule portal in the Plant Control Room. Throughout the shift, the dispatch schedule often varies. If there is increased volatility in the market, the Trader will frequently call and discuss mill ranges and capacities in the mill range, or they may give prior notice that bidding will change significantly and to either drop or hang on to mills.

A major turning point in electricity trading has been integrating renewable energy sources, particularly grid and rooftop solar power. This shift has reduced reliance on traditional power stations like Eraring and introduced new challenges, such as negative pricing for the station's output during the day. In these cases, the surplus energy generated by renewables forces companies like Origin to pay the Australian Energy Market Operator (AEMO) for the excess energy—a situation unimaginable in the earlier days of the industry.

The modern energy market is rife with risks, especially when managing large-scale operations like those at Eraring. Potential issues, such as unit trips, failures in returning units to service, tube leaks, and other technical problems, present significant challenges.

These developments in electricity trading reflect broader trends in the energy sector, highlighting the industry's ongoing adaptation to new technologies, market demands, and the growing influence of renewable energy sources. This historical context provides a deeper understanding of the challenges and strategies that have shaped the evolution of energy trading practices in Australia.

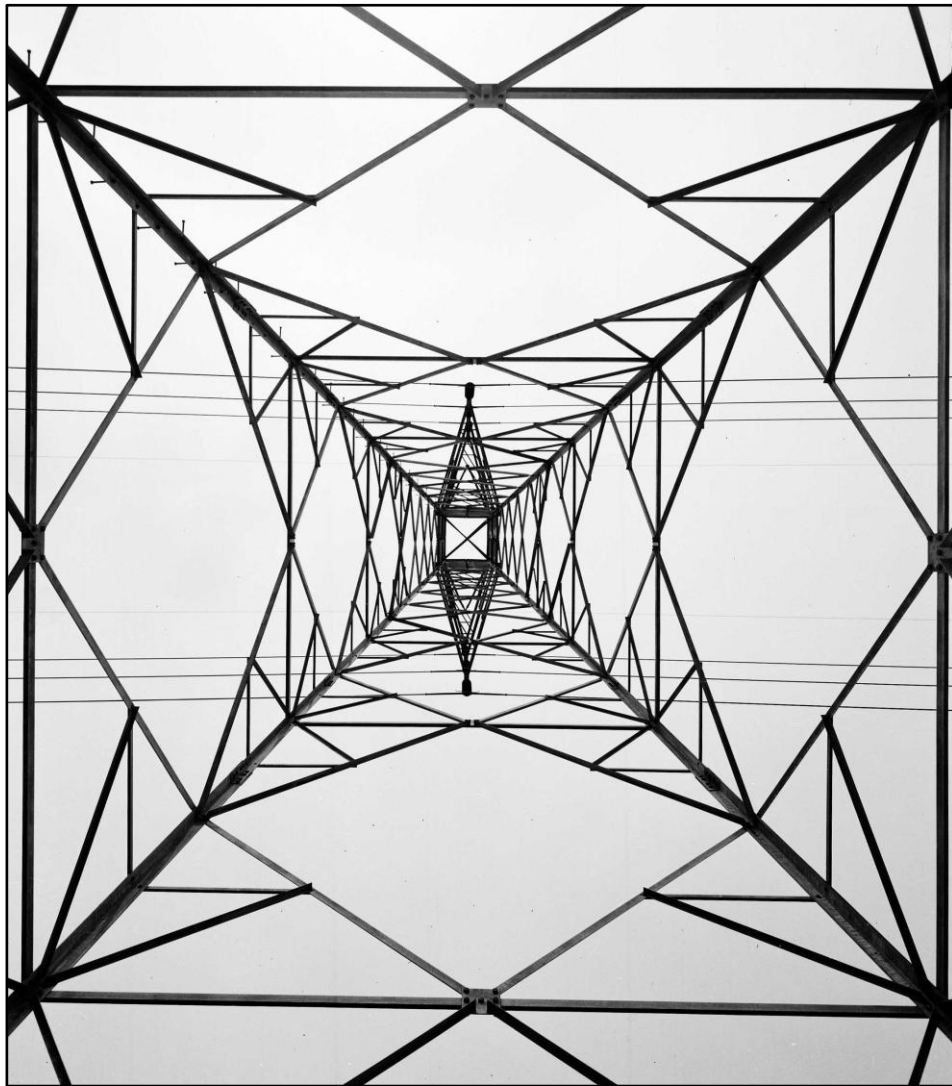


*Figure 68 330kV Transmission Tower, February 1961  
(ECNSW 03042)*



*Figure 69 Generator equipment being off-loaded in Newcastle, January 1980  
(ECNSW 12357)*

## Processes and Procedures That Made a Difference

Histories of industrial complexes invariably encompass engineering and technical aspects. Some, as does this history, also discuss the contributions people make. What is missing are the strategies and procedures employed to achieve an output. The following discussion on Unit starts, Job Sheets, Operator duties and Information Management are just a few of the essential processes and procedures.

### *Unit Starts*

Ering's daily functioning relies on various critical components. Maintenance strategies, coal utilisation, ash and dust disposal, financial management, occupational health and safety, and human resources policies all contribute to its smooth operation. However, at the core of Eraring's existence lies a singular objective: electricity generation. The management of its generating units assumes utmost significance. The following discussion about steam and metal temperature control highlights a crucial activity that may not typically appear in a traditional history; nevertheless, they are indicative of those processes and procedures critical to the success of Eraring.

The startup of a generating unit is one of the pivotal technical procedures at the power station. This discussion briefly covers steam and metal temperature control during startup, as well as unit start methods. Although these details may appear highly technical, their inclusion underscores their crucial role in Eraring's operational history.

Control of steam and metal temperatures is crucial during turbine startups for several reasons:

### *Thermal Stress*

Steam turbines operate at high temperatures and pressures, and sudden temperature changes can cause thermal stress in the metal components. The turbine rapidly goes from a cold state to operating temperature during startup. If the temperature changes too quickly, it can lead to differential expansion of the metal parts, causing thermal stress and potential mechanical failure. Therefore, it is crucial to control the rate of temperature change to minimise thermal stress and ensure the integrity of the turbine components.

### *Material Integrity*

Metal components of a steam turbine, such as blades, rotors, and casings, are designed to withstand specific temperature ranges. Exceeding these temperature limits can result in material degradation, including creep, fatigue, or structural failure. By carefully controlling the steam and metal temperature during startup, operators can prevent overheating and maintain the structural integrity of the turbine components.

### *Efficiency and Performance*

Steam turbines are designed to operate efficiently within a specific temperature range. Optimal thermal conditions ensure that the steam expands and imparts maximum energy to the turbine blades, improving efficiency and power output. During startup, bringing the steam and metal

temperature to the desired operating range ensures the turbine operates at its designed efficiency and performance levels.

### *Thermal Expansion*

Metals expand with increasing temperature, which needs to be accounted for during turbine startups. If the metal temperature differs significantly from the desired operating temperature, the components' expansion or contraction can cause misalignment, rubbing, or other mechanical issues. By carefully controlling the temperature, operators can ensure that the turbine components expand uniformly, minimising the risk of damage.

Overall, controlling the steam and metal temperature during turbine startups is crucial to prevent thermal stress, maintain material integrity, optimise efficiency, and ensure proper alignment of the turbine components. It helps to extend the turbine's lifespan, improve reliability, and prevent costly maintenance or repairs.

### *The Classification of Unit Startups*

Eraring units have been using the saturation warming of the High Pressure (HP) and Intermediate Pressure (IP) cylinders for many years. This process was used at Liddell and maybe at stations before that. Saturation warm-through is a process used to prepare large steam turbines for startup by gradually warming their critical components—such as the High Pressure (HP) and Intermediate Pressure (IP) cylinders—to minimise thermal stress and ensure safe, efficient operation. This technique is particularly important for turbines in thermal power plants, where large temperature differences can cause metal components to expand or contract unevenly, leading to damage.

### *Job Sheets and Operational Efficiency<sup>31</sup>*

Eraring drew upon various strategies and processes from its predecessor, Electricity Commission power stations. Liddell's Job Sheet system was one of these. This system, an essential contributor to the station's uninterrupted 50-year operation, was developed with the realisation that a single approved procedure was necessary for each critical task. It acknowledged that the potential approaches to a task could be as numerous as the individuals authorised to carry them out and that some methods were superior to others. The essence of a Job Sheet is to articulate the sanctioned procedure for accomplishing a specific objective.

Ron Hollis, former Charge Engineer at Liddell and Eraring, has suggested that the foundational format for Job Sheets was adapted from NASA.<sup>32</sup> Notably, Liddell was the pioneering ECNSW station that embraced this system instead of the Check Sheets used by its predecessors.

A Job Sheet comprises a sequential set of actions to achieve a desired outcome. These actions span a spectrum, from preparing equipment for service to its actual deployment. For instance, readying an Eraring generating unit for service could entail up to 128 Job Sheets over a 40-hour period.

| STEP | ACTION                                                                                   | RISKS, HAZARDS/ ADDITIONAL INFORMATION |      |      |      |
|------|------------------------------------------------------------------------------------------|----------------------------------------|------|------|------|
|      | a) Unit No.          Mill:<br>b) Date:                                                   |                                        |      |      |      |
| 1.   | At BURNER LEVELS:                                                                        | AT EACH PF LINE                        |      |      |      |
|      | OPEN the PF line isolating valve                                                         | No.1                                   | No.2 | No.3 | No.4 |
| 2.   | OPEN the COOLING AIR ISOLATING VALVES:                                                   |                                        |      |      |      |
|      |                                                                                          | AT EACH BURNER                         |      |      |      |
|      | a) PF flame scanner valve                                                                | No.1                                   | No.2 | No.3 | No.4 |
|      | b) Ignitor flame scanner valve                                                           |                                        |      |      |      |
|      | c) Sightglass cooling air valve                                                          |                                        |      |      |      |
|      | d) Ignitor cooling air valve (40mm NB)                                                   |                                        |      |      |      |
| 3.   | Ensure all PF SAMPLING POINT PLUGS are CLOSED tightly, Valves (if fitted) CLOSED         |                                        |      |      |      |
| 4.   | Check connected the POWER and CONTROL SUPPLY CABLES to the burner air register actuators | Now hard wired to actuators            |      |      |      |

Figure 70 Extract from Eraring's Job Sheet B4/1, outlining pre-start procedures for a PF System, showing the steps required to ensure its operational readiness.

Over time, Job Sheets have evolved to provide highly exact directives for the designated actions. The desired action takes precedence, often presented in uppercase, bold, and sometimes coloured typeface. Following this, a thorough equipment description is furnished using capital letters, typically assigning one action per step. Pertinent supplementary information is incorporated as needed. The sequencing of steps is primarily guided by the nature of the task. Occasionally, the sequence might hinge on the physical arrangement of the equipment, for instance, verifying valve positions from the top to the bottom of a boiler.

Introduced during the 1970s at Liddell, the Job Sheet system has persisted in its paper-based form at Eraring. As discussed above, several preliminary pre-start Job Sheets must be completed before embarking on the primary Return-to-Service Job Sheet. To guarantee the execution of these intricate tasks in the approved sequence, Return-to-Service Flow/Activity Charts have been formulated. These charts delineate the multifaceted pathways of activities that need to be executed.

By exploring the significance of Job Sheets at Eraring, we gain insight into the meticulous operational procedures contributing to the station's ongoing success.

### ***Operator Duties: Then and Now***

Eraring's Plant Control Room (PCR) serves as the nerve centre of the station, where operators, technicians, and engineers monitor, regulate, and optimise the generation process. The PCR operates round the clock, initially with three eight-hour rotating shifts and, for the last 10 years, two 12-hour shifts. As each shift begins, there is a crucial handover meeting between the outgoing and incoming personnel. During this meeting, they exchange vital information about the plant's status, ongoing issues, and general updates, ensuring a seamless transition.



*Figure 71 Original Seimens control panel for Units 1 and 2. PPO Frank Stobbs is in the foreground (ECNSW)*

Over the years, the layout of the PCR has changed. The initial arrangement from the 1980s of Siemens hard-wired control equipment involved two control rooms. Units 1 and 2 were controlled from PCR 1 and 3 and 4 from PCR 2. With the control system upgrade to Yokogawa's Integrated Control and Monitoring System (ICMS) beginning in 2004, control of all four units was centralised in PCR 1. The Yokogawa ICMS was upgraded in 2016, and a revamped control room with many more screens was installed.

A network of screens and control stations fills the control room in the current configuration, providing real-time data from various parts of the power station. These highly automated control and monitoring systems track temperature, pressure, flow rates, power output, emissions, and more, giving the operators critical insights into the plant's performance.



*Figure 72 All four units in one PCR. One PPO per Unit.*



*Figure 73 One PPO for two Units and a third PPO monitoring Station Plant to the right*

Implementing the Distributed Control System (DCS) brought about significant changes for operators. There is now only one control room and one Power Plant Operator (PPO) for two units in addition to the Station PPO. The units have been upgraded to 720 MW, with an overload capacity of 750 MW.

Operators have access to the same communication channels as all personnel at Eraring. Initially, two-way radios were the primary mode of communication between operators in the field and the PCR, continuing through the late 2010s. However, in the 2020s, mobile phones have replaced two-way radios as the preferred means of communication.

### ***Operator Inspections: How DORIS 'Helps' APPOs in 2023***

An essential part of an APPO's role was/is to inspect the plant area for which he is responsible – there are no female operators. These inspections are intended to add a layer of protection against equipment failure. For many years, even decades, the Boiler APPO inspected the two boilers allocated to him. The Turbine APPO inspected his turbine plant. These inspections became known as 'Rounds', and it was accepted that they would be carried out at least once per shift. Early Charge Engineer John Zerbes insisted that his APPOs start their rounds before their first cup of tea or coffee of the shift.

What is the APPO looking for in his round? Plant conditions that the control systems are not set up to detect. For example, the APPO would be expected to check for visible signs of water and steam leaks, check valves and oil piping for evidence of oil leaks, and note any unusual vibrations, noises, or smells.

One of the many changes brought on by privatisation in August 2013 was that there had to be a record of plant inspections carried out by Operators. Initially, the Shift Manager recorded the completion of the paper-based Inspection Job Sheets. In 2023, DORIS (Digital Operator 'Round' Information System) supplemented this process.

DORIS is available as a mobile app or an intranet app on an operator's phone. Both display the same screens. The following brief explanation may interest pre-DORIS operators.

The Welcome page leads to an extensive listing of HSE (Health, Safety & Environment) warnings, much like any job sheet.

The next page is a self-explanatory unit selection page, which leads to the 'Round' selection page. Here, the operator can select either the 12-hour or 48-hour 'Round' to carry out. The 12-hour 'Round' covers the safety-critical items, while the 48-hour one touches everything. With the 12-hour 'Round', if the operator has already completed the 'Round', he can use the "All Completed" button to sign off all the steps in one go. He is asked to confirm his selection. If YES, all 12-hour 'Round' actions will be signed off.

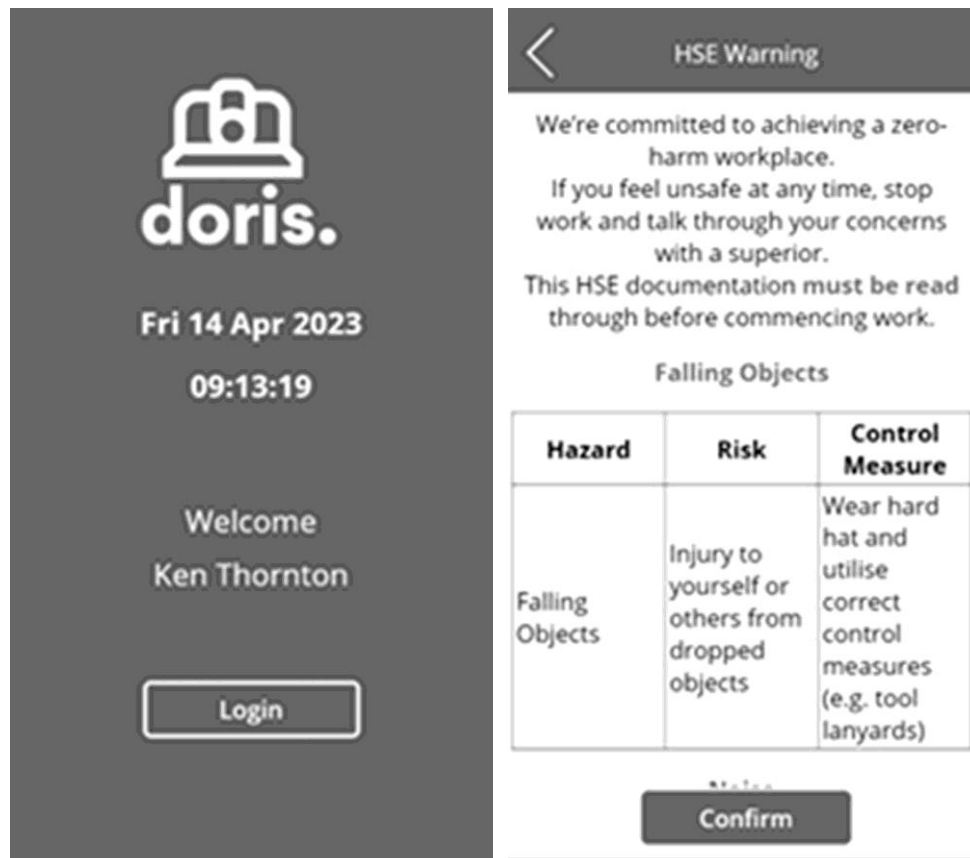


Figure 74 Doris screen shots

The screenshot shows the Doris mobile app interface. At the top, there is a back arrow, the Doris logo, and a 'Feedback' button. Below this, the date 'Fri 14 Apr 2023' and time '09:24:32' are displayed. The main section features a large '12' indicating the '12-HOUR CHECK' status, with a button labeled 'All Completed'. Below this, a large '48' indicates the '48-HOUR CHECK' status, with the text 'Time Left till Reset: 45 h 05 m'.

The screenshot displays two side-by-side panels from the Doris mobile app. The left panel is titled 'Unit 1 - 12-Hour Check' and shows a summary with '22 Total', '22 Left', and '0 Completed'. It includes a search bar with 'L01 (Basement)' and a list of tasks: 'Boiler Induced Draft Fans', 'Turbine Basement', and 'Classifiers & Outlets'. Each task has a checkbox, a 'Last Completed' timestamp, and a list of instructions. A 'Select All' checkbox and a 'Submit' button are at the bottom. The right panel is titled 'Unit 3 - 48-Hour Check' and shows a list of tasks with their completion counts: 'Fabric Filter Damper' (1), 'L01 (Basement)' (33), 'L02 (Mezzanine)' (15), 'L03 (Operating)' (9), 'L04 (Elec Services)' (1), 'L05 (HP Heaters)' (1), 'L07 (Deaerators)' (1), 'L08 (Conveyors)' (1), and 'L11 (Steam Drums)' (4).

Once the type of 'Round' has been selected, the operator is presented with several pages indicating what he is being directed to inspect.

Both app versions allow the operator to leave comments or photos for other operators. DORIS also permits comments and pictures to be amended and updated over time to allow changes to be tracked, for example, if a steam or oil leak is getting worse.



*Figure 75 Coal Plant Stacker / Reclaimer (Eraring Energy)*

*Information Management: A Little-Known Aspect of Eraring*



*Figure 76 Shelves of Document Boxes in one of the station repositories, 2024  
(Jenny Leech)*

In the heart of Eraring, where the constant hum of generators and motors fills the air, several storage areas house row upon row of document archive boxes. At last count, over 9,000 were stacked on shelves nine high. These are a treasure trove, a testament to the station's forty-plus years.

These meticulously organised boxes brim with logbooks, maintenance reports, contracts, and other material. Each page carries the weight of carefully recorded information, chronicling the power station's birth, maintenance, and operation. Every application of a Danger Tag from the last five years, every clause within multi-million-dollar contracts —some dating back to the late 1970s and early 1980s —every maintenance strategy, every overhaul report, and every employee record are meticulously preserved. These records were the lifeblood of the power station, ensuring its smooth and secure functioning.

Retention of these documents is no accident. Documents created before 2013 (privatization) are managed under NSW State Records directives. Post-2013, records are managed based on their technical content or following specific Federal and State legislation. Many documents tell a tale of continuous improvement and adaptation in the face of technological advancements and shifting regulations. Some bear witness to tragic events that should never have occurred.



*Figure 77 Loose documents in an empty office, 2023  
(Ken Thornton)*

Many empty offices and workstations stand frozen in time within the Administration Building as if their occupants left them yesterday. The only challenge is that individuals have moved on to new roles, different workspaces, alternate locations, or retirement. However, their documents remain, necessitating a review to determine what should be retained and what has reached its expiration date.

The Warehouse has pallets of 1980s reel-to-reel magnetic computer tapes, each storing data from past operations. This data was captured hourly for routine storage or every four minutes for special storage. It encompasses analogue values such as pressures, temperatures, flows, digital statuses, and event data. Thirty years later, there is a good chance they are unreadable even if there is equipment to read them. The challenge has been gaining approval from Origin and NSW State Records to destroy them.

Despite the initial appearance of chaos, there is an underlying order to the documentation. The thousands of archive boxes contain physical documents meticulously catalogued in Origin's Information Management system.

One complexity in managing this wealth of documentation arises from Origin's announcement that the station's potential closure in late 2027 due to economic reasons will occur well before its 50th anniversary. A project is underway to sift through this mountain of documentation, determining what must be retained, transferred to NSW State Records, or safely disposed of.

In addition to tangible records, digital repositories play a vital role. Online databases house data on energy production, environmental impact assessments, management decisions, and even a trove of historical photographs capturing Eraring's evolution.

However, navigating this vast collection of documents requires caution. Among the many records, there are sensitive materials, including confidential state and commercial documents, as well as personnel files. With these restrictions in mind, the challenge lies in uncovering the stories that reveal the station's history. These records, ranging from operational logs to safety protocols, offer key insights into not only the technical development of the power station but also its effects on New South Wales, the people who worked there, and the surrounding community and environment.

## Maintenance Strategy

Eraring's maintenance strategy has evolved in response to various factors, including technological advancements, equipment conditions, safety regulations, and management decisions. Early decisions on maintenance and operation strategies would have been based on the ECNSW's 30+ years of experience at stations, including Liddell, Wallerawang, and Munmorah. Vales Point B experiences would have been especially relevant as that station was the first to have Toshiba 660 MW turbine generators, as did Eraring. Such strategies minimise downtime, optimise asset performance, enhance safety, and reduce operational costs.

Some common elements of the station's maintenance strategy include:

### *Asset Condition Assessment*

Eraring's initial maintenance strategy would have begun with a thorough assessment of the condition of all critical assets, such as turbines, boilers, generators, and auxiliary systems. This assessment would have involved inspections, testing, and data analysis to identify potential issues or degradation.

### *Preventive Maintenance*

Preventive maintenance tasks would be implemented based on manufacturer recommendations, historical performance data, and industry best practices. Regular servicing and scheduled inspections would be conducted to prevent equipment failures and extend the lifespan of components.

### *Predictive Maintenance*

To complement preventive maintenance efforts, Eraring employs predictive maintenance techniques. These techniques utilise condition monitoring systems, sensors, and data analytics to predict equipment failures and proactively address issues before they result in unplanned downtime. Closely aligned with condition monitoring, thermography, and ultrasonic detection of faults have shown significant improvements. Likewise, motion amplification is an important advancement that has enabled the identification of problems related to machinery foundations that emerge at the 35-40+ year mark.

Detecting process and plant anomalies has proven to be a significant advancement. It involves identifying unusual or abnormal behaviour in the operation of systems and equipment. Anomalies can arise from various factors, including equipment malfunctions, human errors, or environmental changes.

The significance of anomaly detection lies in its ability to prevent potential failures, reduce downtime, and enhance the overall efficiency and safety of the power generation process. An unexpected equipment failure or operational issue can lead to significant financial losses, disruption of power supply, and, in some cases, pose risks to personnel and the environment.

Historically, anomaly detection in power plants has been conducted through manual monitoring by experienced operators and engineers. They would observe and analyse data from various sensors and instruments, looking for deviations from standard patterns. However,

technological advancements, automation, and data analytics have led to the development of more sophisticated methods to enhance anomaly detection processes.

There are many applications of anomaly detection at Eraring. A notable example is the early detection of boiler tube leaks.<sup>33</sup> The system uses a machine learning algorithm that analyses data from existing sensors to detect unusual patterns, trends, and combinations associated with boiler tube leaks. The primary sensors are the boiler acoustic detectors that have been used successfully for many years. These detectors are very effective for detecting boiler tube leaks, but a simple on/off alarm can be slow to detect leaks and may miss indications at low loads. The anomaly detection system examines multiple sensors, including boiler acoustic detectors, boiler pressure, and feedwater makeup flow. Deviations from established normal operating conditions are identified. If these deviations reach a threshold value, a warning is initiated for our engineering and maintenance teams rather than an alarm being directly sent to the operators. The anomaly can then be investigated, and appropriate action can be taken. Anomaly detection is often the first indication of a tube leak, and it may take several days from detection to confirmation.

Early detection warns of repairs required, allowing repairs to be completed in a planned rather than breakdown manner. Early detection can also minimise consequential damage and reduce repair time and cost. Similar systems have since been rolled out to other plant areas, again with a high success rate.

### ***Planned Shutdowns and Overhauls***

The maintenance strategy includes planned shutdowns during low-demand periods or scheduled maintenance outages to perform significant overhauls and equipment replacements. These planned shutdowns allow for extensive maintenance work that is not feasible during regular operation.

### ***Maintenance, Upgrades, and Asset Management***

As with previous stories, this discussion of the Unit 2 outage in 2023 aims to highlight an essential process that ensures the station's ongoing efficient operation. It is not the first significant outage at the station; that would have been in the late 1980s or early 1990s, and it will not be the last.

*Unit Outage – late 2023<sup>34</sup>*

*Figure 78 Boiler ‘Dance Floor’, October 2023  
(Origin Energy)*

In the lead-up to the outage in late 2023, a meticulous planning phase unfolded over nine months, engaging around 100 Origin staff and accumulating nearly 4,000 hours of preparation. The Unit was desynchronized from the grid in the early morning hours, marking the commencement of an intricate and large-scale operation.<sup>35</sup>

The operation unfolded on an immense scale, with an estimated cost of many millions of dollars and over 250,000 contractor personnel hours spanning 10 weeks. 700 contractors worked tirelessly six days a week, supported by 38 suppliers and 29 service providers. A staggering 1,100 tonnes of scaffolding were employed, emphasising the colossal nature of the undertaking. Approximately 80 to 100 Origin personnel were pivotal, dedicating countless hours to the project's success.

The planning spanned a gruelling nine months, encompassing six distinct plant areas: Boiler, Turbine, Turbine Auxiliary, Valves, Electrical, and Cooling Water. 468 valves required attention, and roughly 1,500 welds had to be completed within 55 days. At the outage's peak, simultaneous work occurred across 50 areas and confined spaces.

Week 1 of the outage marked significant milestones, with a substantial number of personnel on-site, core systems isolated, inspections conducted in all areas, and the completion of the Boiler ‘Dance floor’, a scaffold that facilitates access to the boiler tubes within the furnace. Turbine Crossover piping was successfully removed, and the Cooling Water Lobster-back piping underwent routine inspection and repairs.

Week 2 resulted in approximately 50,500 labour hours, including the removal of LP Turbine outer casings, advancing valve overhauls, HV testing, and reheat outlet header inspection.

Week 3 marked a crucial point with approximately 80,000 hours of work accomplished. LP Rotors were removed for initial inspections, the IP Rotor's casings were dismantled, and progress was made on Reheat Outlet Headers (RHOH), furnace inspections, and High Energy Pipework weld inspections.

Week 4 saw over 103,000 hours worked, with inspections at around 55% completion and approximately 500 outage personnel on-site. Safety remained a top priority, with numerous safety observations and life-saving control verifications conducted throughout the process. A key milestone was the delivery and placement of an ID Fan 11kV Motor.

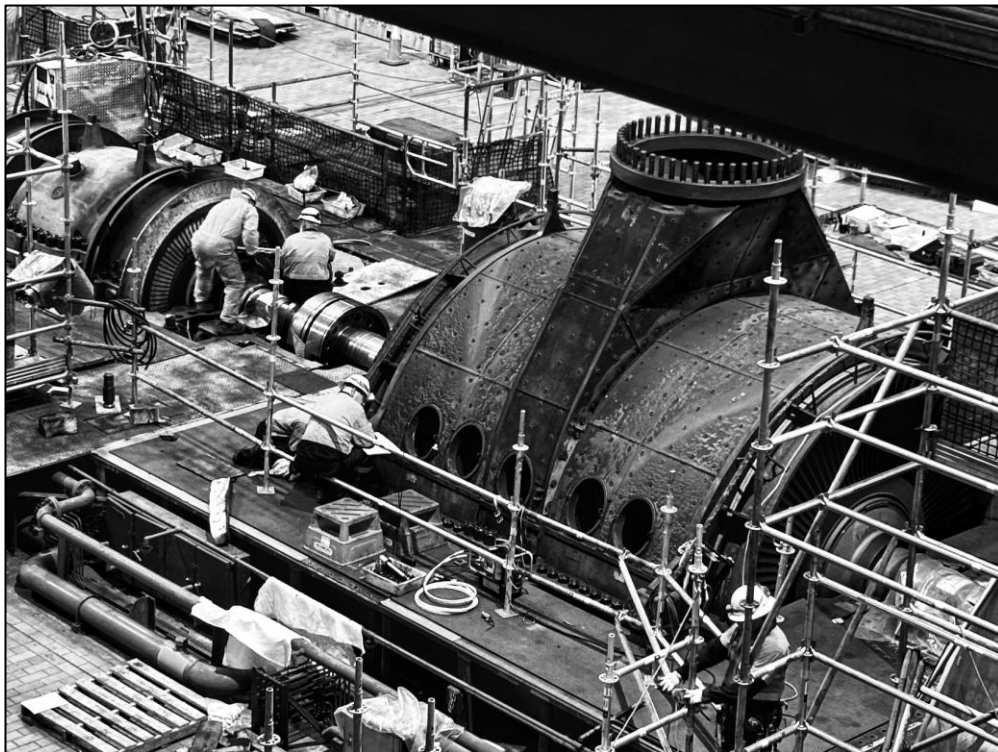


*Figure 79 Unit Outage, 2024  
(Ken Thornton)*

By Week 6, commissioning was underway in various areas. RHOH works were ahead of schedule, and the Secondary Superheater (SSH) scope had been finalized. Some unexpected issues surfaced, including the need to replace IP Rotor bearings. Valve works progressed well, and electrical works neared completion. A safety award was presented as the plant approached commissioning, acknowledging the support of Origin's Ops, Maintenance, and Engineering teams in preparing Unit 2 for summer operation.

Week 7 introduced its share of challenges, with unexpected findings putting the Boiler, the Turbine, and the Cooling Water head-to-head on the critical path. Despite these obstacles, the project remained on track to meet its target dates, with significant milestones having been reached. Notably, LP Rotors were primed for reinstatement; the Secondary Superheater tube replacement scope was expanded to 150 tube replacements. The DW Cooler re-tube project progressed efficiently, and work on the Hot Reheat Outlet Header antler tube replacement continued, with approximately 80% of the welds completed.

Week 8 witnessed the achievement of significant milestones, including the re-commissioning of the Auxiliary Cooling Water (ACW) system, completion of the Cooling Water (CW) System, welding of the Reheater Outlet Header, re-tubing of the Distilled Water Cooler, and the commencement of turbine alignments. Birthdays were celebrated, and the schedule progress was 85% complete, with 221,000 hours of work accomplished.

After over 80 days of intensive effort, the Unit reached a significant milestone – resynchronisation. Overall, the operation involved over 250,000 scheduled work hours, significant repairs to pressure parts, rectification of IP Turbine Vibration issues, overhauling 471 valves, and erection and dismantling of 1,100 tonnes of scaffolding. Switchboards, transformers, and the Condensate Water system were tested and repaired, known defects rectified, and the plant returned to service.

To achieve this milestone, the Overhaul team worked with people from Engineering, Maintenance, Operations, Procurement, the Warehouse, Health and Safety, IT, and Finance. While there is still work to be done to ensure the safety, efficiency, and reliability of the Unit over the summer, this resynchronisation marks a significant achievement and a testament to the collective efforts of all involved in the project.



*Figure 80 Origin Unit Outage Crew*  
(Origin)



*Figure 81 High Voltage Switchyard over High-Level Canal  
(ECNSW)*



*Figure 82 Small, but there are major consequences if operated  
(Ken Thornton)*



*Figure 83 Main Receiving Bin under construction, May 1981  
(ECNSW 13406)*

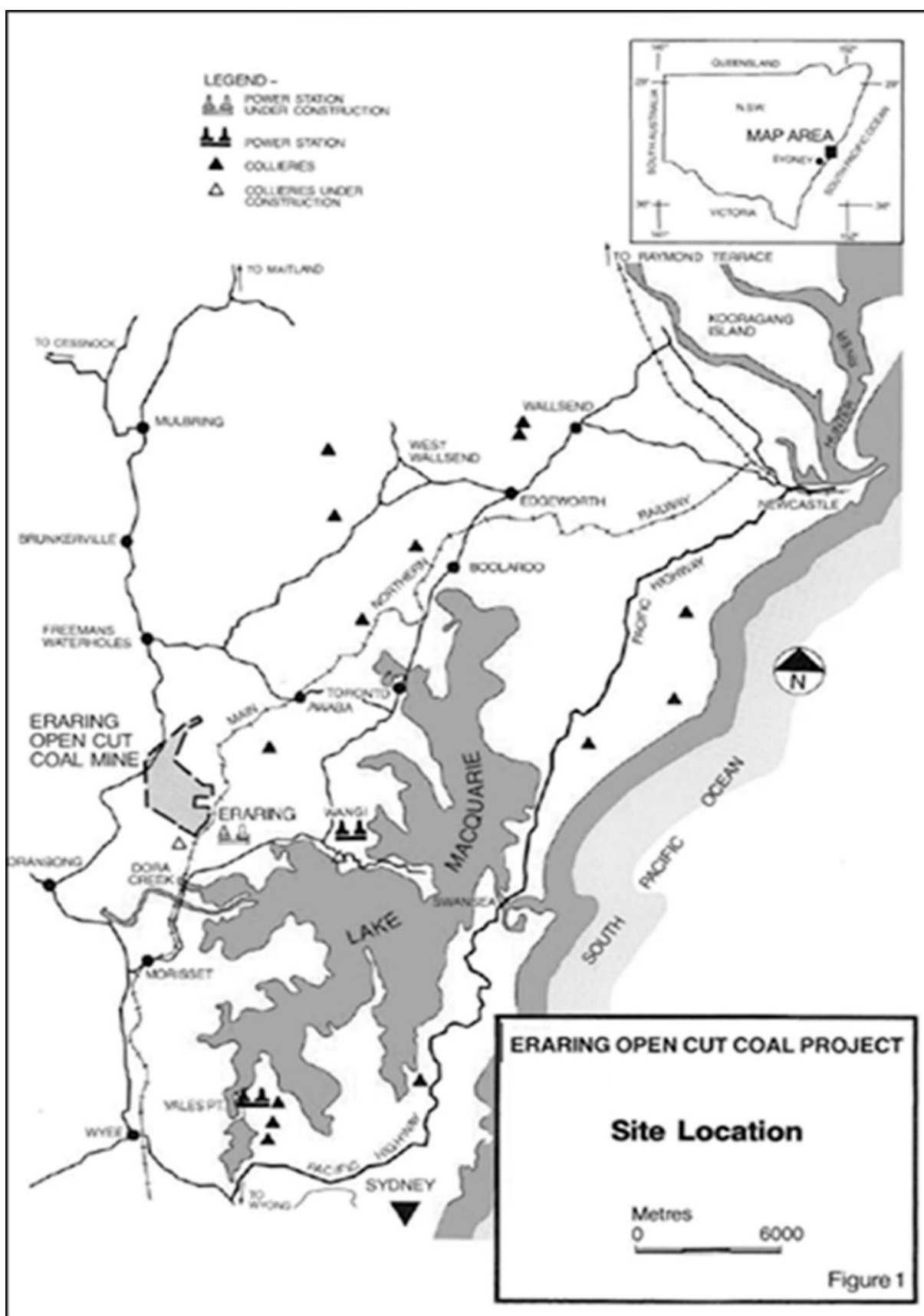


Figure 84 Open cut site location  
(ECNSW)

## CHAPTER 7 OPERATIONAL MILESTONES:

### Eraring Open-Cut Mine

In March 1976, the construction cost estimate for the station was released, indicating that the  $2 \times 660$  MW station was projected to cost approximately \$130 million.<sup>36</sup> However, by the following month, it was reported that construction was imminent, and the cost for four 660 MW units had risen to \$300 million.<sup>37</sup> The initial Environmental Impact Statement (EIS) mentioned the possibility of adding two additional units. However, a second EIS in March 1978, which outlined the details of the third and fourth units, led concerned residents and interest groups to organise a public forum in Toronto.

The primary concern expressed during the forum was not related to the additional generating units but focused on the potential sourcing of coal for these units from a new local open-cut mine. How the mine's announcement was made caused significant apprehension among the residents. The *Newcastle Morning Herald* highlighted that the ECNSW had nearly evaded its obligations by treating the public with disdain, resulting in a growing backlash from the community.<sup>38</sup>

In May 1980, the Environmental Impact Statement for the open-cut mine stated that its primary objective was to use the energy resource efficiently while minimising severe or permanent environmental effects.<sup>39</sup> The EIS also acknowledged that the importance of the open-cut proposal had substantially increased due to successive oil crises, which had generated a global demand for steaming coal and subsequent price increases.<sup>40</sup>

To provide a broader context, it is worth noting that the early to mid-1980s marked the end of the unquestioned expansion of New South Wales generation assets. Despite the failures of the Liddell generators, the Commission faced significant setbacks in obtaining approval to fuel Eraring with coal from an adjacent open-cut mine planned for development.<sup>41</sup> Fuelled by open-cut mines, Liddell boasted the lowest coal costs per MWh Sent Out among all the thermal power stations operated by the ECNSW. This cost advantage made Liddell the preferred model for fuelling Eraring.

The proposed Eraring mine was intended to be located near the station, between the main northern railway and the Cooranbong–Freemans Waterhole road. However, it was only six kilometres north of Morisset, nine kilometres southwest of Toronto, and three to four kilometres from the village of Dora Creek and the township of Cooranbong. In contrast, the open-cut mines serving Liddell were between eighteen and twenty-five kilometres away from the major population centres of Singleton and Muswellbrook despite being close to the villages of Ravensworth and Glennies Creek. The concerned residents near Eraring could easily observe the adverse consequences of Liddell's open-cut mines, which raised anxieties about the potential effects of the Eraring development. Unlike the limited ground-level views of the visual impact caused by the Liddell open-cut mines, the public would have been able to fully comprehend the extent of the visual impact from the Eraring mine at easily accessible high-elevation lookouts on the eastern side of the Watagan Mountains. Consequently, community opposition to the proposed development grew intense.

In September 1980, the ECNSW wrote to the Department of Environment and Planning, addressing the key objections raised by the opponents of the mine. These objections encompassed concerns regarding air quality, noise, the effect of blasting, water pollution, the loss of natural areas, tourism, quality of life, health, and the visual impact on buildings. Notably, the Department received over 1,200 requests for property inspections before the initiation of mining operations.

Eventually, the ECNSW withdrew its proposal in response to objections from the NSW Department of Planning and Environment, which cited concerns over noise, dust, water pollution, and the detrimental impact of blasting on the surrounding area.<sup>42</sup>

An unsubstantiated report suggests that when Powercoal was sold to Centennial Coal in the early 2000s, it acquired the rights to the Awaba open-cut.<sup>43</sup> Approval was again sought to develop the opencut but was rejected by the state government, and legislation was introduced to ban opencut mining west of Lake Macquarie.



*Figure 85 This is the type of development the Lake Macquarie community were advocating against. Hebden Open Cut Mine near Liddell Power Station, February 1972 (ECNSW 11039)*



*Figure 86 Newstan is an underground mine feeding Eraring, October 1960  
(ECNSW 02923)*

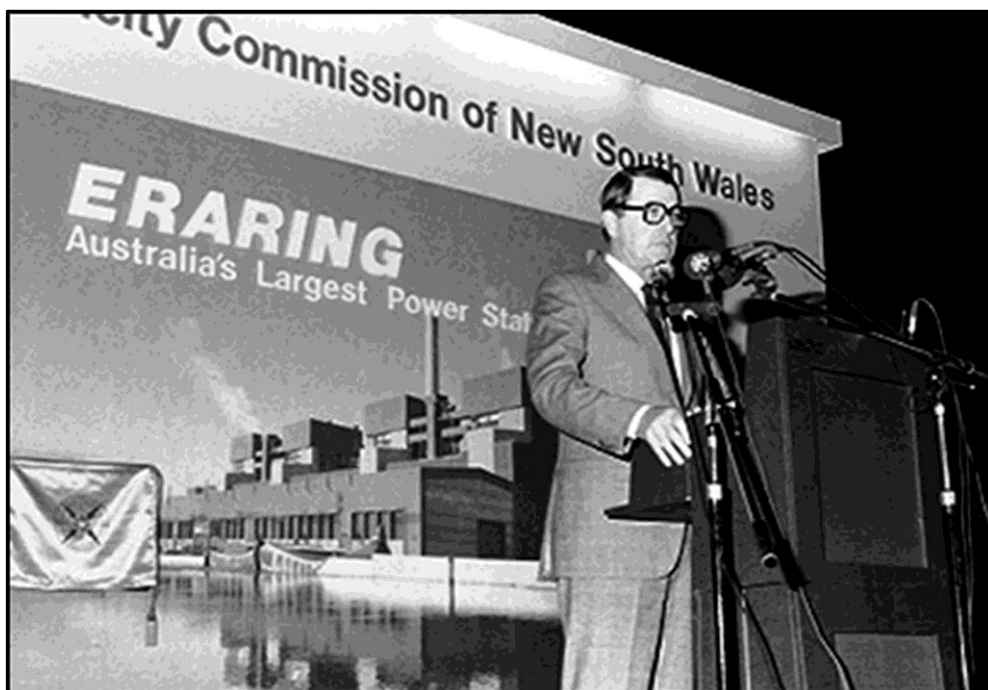


*Figure 87 Premier Neville Wran officially opening Eraring, 29 June 1984  
(ECNSW 13769)*



*Figure 88 PPO George McCulloch explaining a technical point to Premier Wran and ECNSW General Manager Frank Brady, 29 June 1984  
(ECNSW)*

## Official opening of the station

The journey from synchronising the first unit on 22 March 1982 to the operational milestone of the fourth unit on 17 April 1984 culminated in an official opening ceremony on 29 June 1984. While aimed at celebrating technological and collaborative success, this event masked the nuanced reality of the plant's operation and the personal stories of those involved.

The venue, the main warehouse, was transformed for the occasion, bringing together employees, their families, contractors, and a distinguished official party, including Frank Brady, the ECNSW's General Manager, and NSW Premier Neville Wran. The narrative presented was one of complete success, with all units claimed to be fully operational at full load.

Yet, the full operational status has been cast in doubt in at least one instance. Forty years later, the Power Plant Operator on Unit 2 at the time suggested that contrary to the official statement, only three units were in service, and Unit 2 was out of service.<sup>44</sup> In a moment of improvisation, technicians had been directed to adjust Unit 2's MW meter to suggest it was also operating at full load, ensuring the station appeared fully functional to the visiting officials.

Parallel to these orchestrated presentations, the event also saw moments of personal defiance and individuality. George McCulloch, responsible for Unit 1, chose to disregard the formal dress code as a statement of his political and personal beliefs, resulting in an ironic and memorable encounter with Premier Neville Wran.

Following the official proceedings, the station hosted an Open Day, allowing employees, contractors, and their families a closer look at the operations. This event, held the day after the formal opening, provided a less formal and more transparent view of the plant's operations. It provided an opportunity for those directly involved in the station's construction and operation, as well as their families, to tour the facilities, understand the operational complexities, and appreciate the scale of their achievements in a more intimate and personal setting.

The contrast between the official opening and the Open Day highlights the multi-layered nature of such milestones. While the official event was marked by speeches and ceremonious declarations of success, the Open Day allowed for a deeper, unfiltered connection between the plant and its community. It served as a reminder that, beyond the grand declarations of operational success, the heart of the station's achievement lies in the collective effort and shared experiences of its individuals.

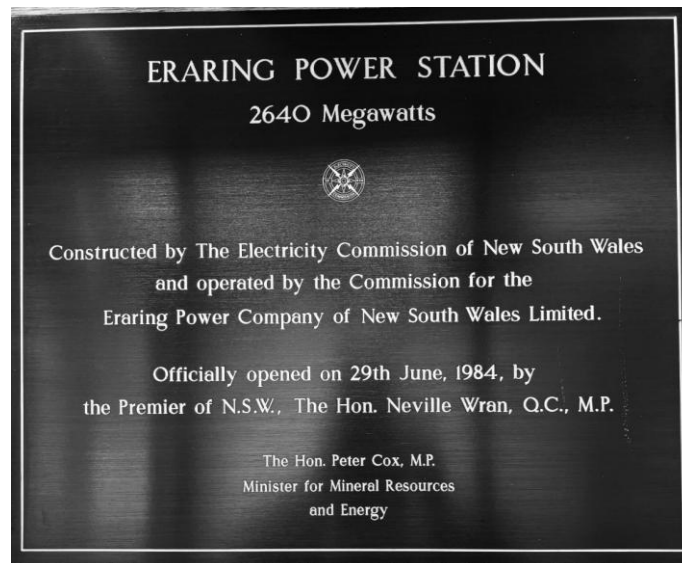


*Figure 89 Plaque noting the opening of Eraring  
(Ken Thornton)*

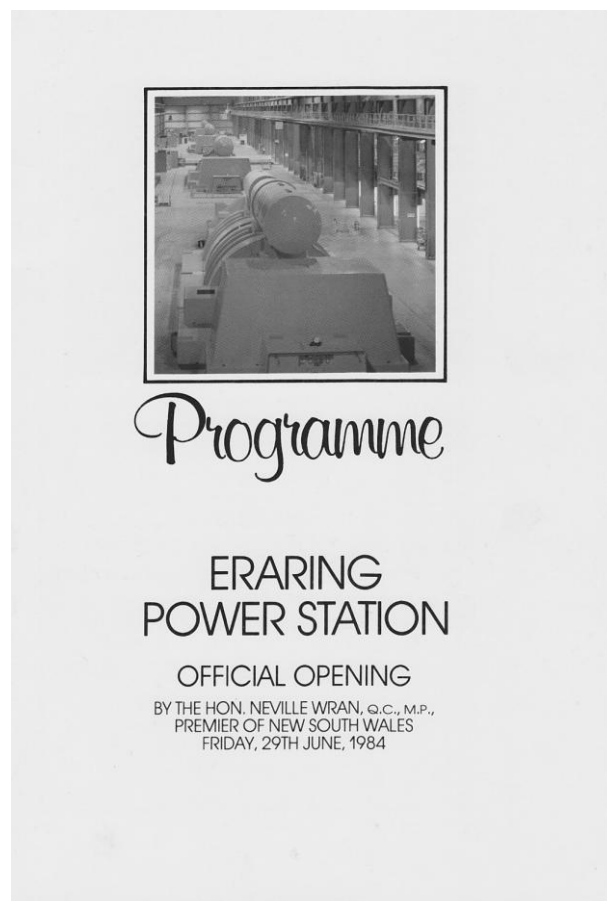


*Figure 90 Invite the Opening, June 1984  
(ECNSW)*

## World Record

Amid the heady political discussions on disaggregation in the mid-1990s, Pacific Power continued to generate electricity. Although important, the political debates rarely directly influenced operations and maintenance activities. Nowhere is this clearer than in the setting of a world record in December 1996 for the longest continuous in-service operation for a large thermal generating unit. Unit #4 achieved a record of 673 days, 20 hours, and 52 minutes of continuous in-service operation on 31 December 1996, as verified by Guinness World Records. A thrust wear detector pressure switch failure ended Unit 4's run. The previous world record of 604 days was held by American Electric Power's Mountaineer Plant in West Virginia. The current record (as of the day of writing) of 1,073 days and one hour is held by Stanwell Corporation's Unit 4 at the Stanwell Power Station, Queensland.<sup>45</sup>

While not a corporate goal, Pacific Power believed Eraring's record was indicative of the organisation's technical and engineering expertise. For many employees at Eraring, it illustrated the pride in their technical achievement.<sup>46</sup> It demonstrates the camaraderie engendered when a comparatively small group of individuals strive for a goal through a collaborative technical and engineering culture, often in addition to their normal work responsibilities.<sup>47</sup> Pacific Power viewed this world record as a welcomed yet unsought demonstration of its technical expertise.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                |                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Minister for Energy<br>New South Wales, Australia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                |  |
| TO:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ALL STAFF AT ERARING POWER STATION                                                                             |                                                                                       |
| FROM:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TREASURER, MINISTER FOR ENERGY, MINISTER FOR STATE AND REGIONAL DEVELOPMENT AND MINISTER ASSISTING THE PREMIER |                                                                                       |
| SUBJECT:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ERARING POWER STATION WORLD RECORD                                                                             |                                                                                       |
| <p>I have been advised by the Chairman that No. 4 Unit at Eraring Power Station achieved a new world continuous in-service record of 673 days. This follows on from the Australian in-service record in 1995 for No. 1 Unit.</p> <p>I would like to take the opportunity to personally thank every member of the management and staff for these outstanding achievements.</p> <p>Every employee should be justifiably proud of their part in these achievements and demonstrates such an excellent team effort.</p> <p>I would like to congratulate all staff and wish you well in continuing this outstanding success.</p> <p>Yours sincerely</p> <p></p> <p><b>Michael Egan MLC</b><br/>MINISTER FOR ENERGY</p> |                                                                                                                |                                                                                       |
| 24 FEB 1997                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                |                                                                                       |

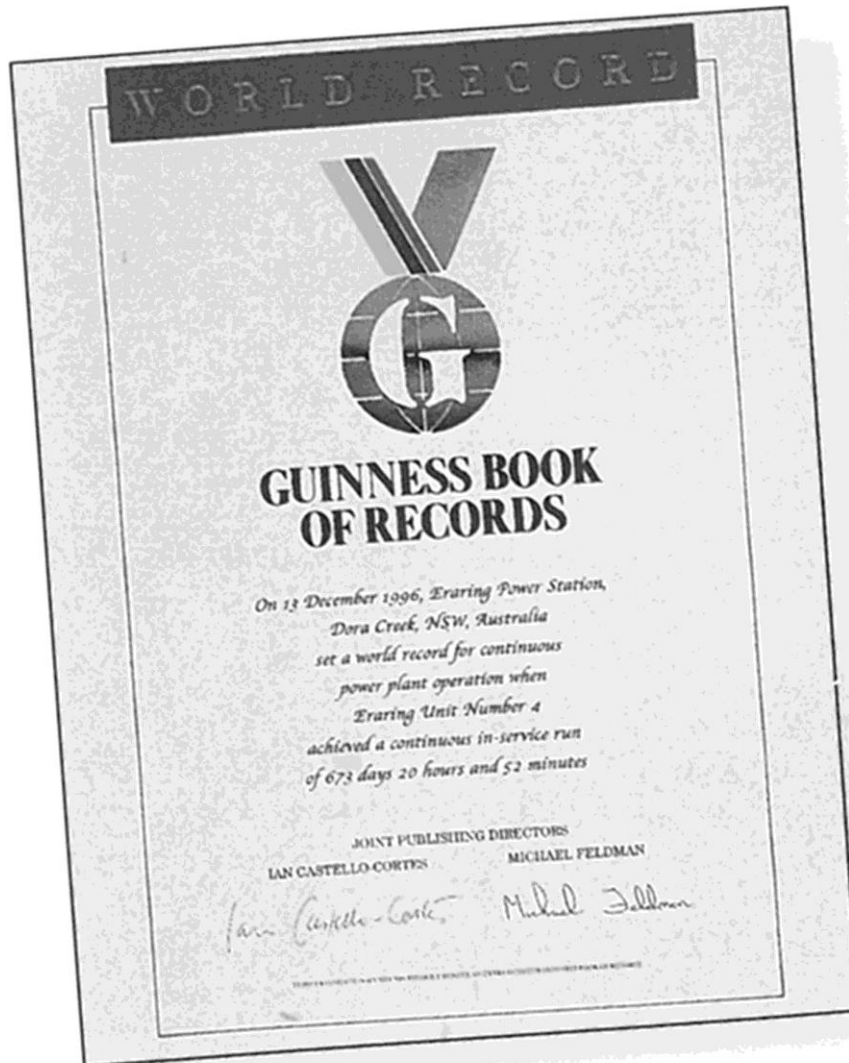


Figure 91 Guinness Book of Records certificate noting Unit 4's world record

## 720 MW Upgrade

Between 2009 and 2011, Eraring underwent a significant upgrade to enhance its capacity and efficiency. This upgrade was part of a broader strategy to improve the power station's reliability and performance while reducing its environmental impact.

### *Overview of the Upgrade*

#### **Capacity Enhancement:**

The original units at Eraring were designed to produce 660 MW each. The upgrade involved enhancing the capacity of each unit to 720 MW, with some reports indicating that the capacity could reach up to 750 MW under certain conditions. This increase in capacity was achieved through several technical improvements, including the installation of advanced turbines and other high-efficiency components.

#### **Technological Improvements:**

##### **Turbine Upgrades:**

- **High-Pressure Turbine (HPT):**
  - The existing HPT components were replaced with advanced design elements, such as new high-efficiency blades and upgraded steam paths. This increased the pressure ratio and improved the overall thermal efficiency.
  - Enhanced materials and coatings were utilised to withstand higher temperatures and pressures, thereby contributing to increased longevity and improved performance.
- **Intermediate-Pressure Turbine (IPT):**
  - Similar upgrades were made to the IPT, focusing on improving steam flow and minimising leakage. This involved redesigning the steam path and installing new rotors and casings.
  - The integration of advanced sealing technologies helped reduce steam losses, enhancing overall efficiency.
- **Low-Pressure Turbine (LPT):**
  - Although the LPTs were not the primary focus, minor modifications were made to improve aerodynamics and reduce mechanical losses.

##### **Generator Improvements:**

- **Stator and Rotor:** The generator stator and rotor were rewound with improved insulation materials to handle the increased power output. This allowed the generators to operate at higher efficiencies and with greater reliability.
- **Cooling Systems:** Enhanced cooling systems were installed to manage the increased heat load from higher output. This included the use of more efficient heat exchangers and upgraded cooling water pumps.

##### **Boiler Enhancements:**

- The boilers were upgraded to produce the increased steam flow required for the higher-capacity turbines. This involved significant modifications to improve combustion efficiency and heat transfer, including the installation of advanced burners and improved furnace design.
  - Upgrades to the superheater and reheater sections improved steam quality, contributing to higher turbine efficiency.

#### **Control Systems:**

- **Distributed Control System (DCS):**
  - A new DCS was installed to enhance operational control and monitoring. This system provided real-time data on plant performance, enabling more precise control of various processes.
  - The DCS included advanced diagnostics and predictive maintenance capabilities, reducing the likelihood of unplanned outages.

#### **Environmental Controls:**

To mitigate the environmental impact of the increased output, the upgrade included enhancements to the emission control systems. This included creating an Attemperating Reservoir to manage the water temperature being returned to Myuna Bay.

#### **Impact on Operations:**

- **Increased Efficiency:** The upgrades resulted in higher thermal efficiency, meaning more electricity could be generated from the same amount of coal. This also translates to a reduction in greenhouse gas emissions per unit of electricity generated.
- **Enhanced Reliability:** The modernisation of the equipment and control systems improved the overall reliability of the power station, reducing the likelihood of unexpected outages.
- **Extended Lifespan:** The upgrades are expected to extend the operational lifespan of the Eraring Power Station, allowing it to continue contributing to the electricity grid for several more years.

#### ***Strategic Significance***

The Eraring upgrade was part of a broader trend in the energy sector to improve the efficiency and performance of existing coal-fired power stations while balancing the transition to more sustainable energy sources. While coal remains a significant part of the energy mix, upgrades ensure that the existing infrastructure operates as efficiently and cleanly as possible.

This approach also provides a buffer as renewable energy sources are scaled up, ensuring a reliable and stable supply of electricity to meet the demands of consumers and industries.

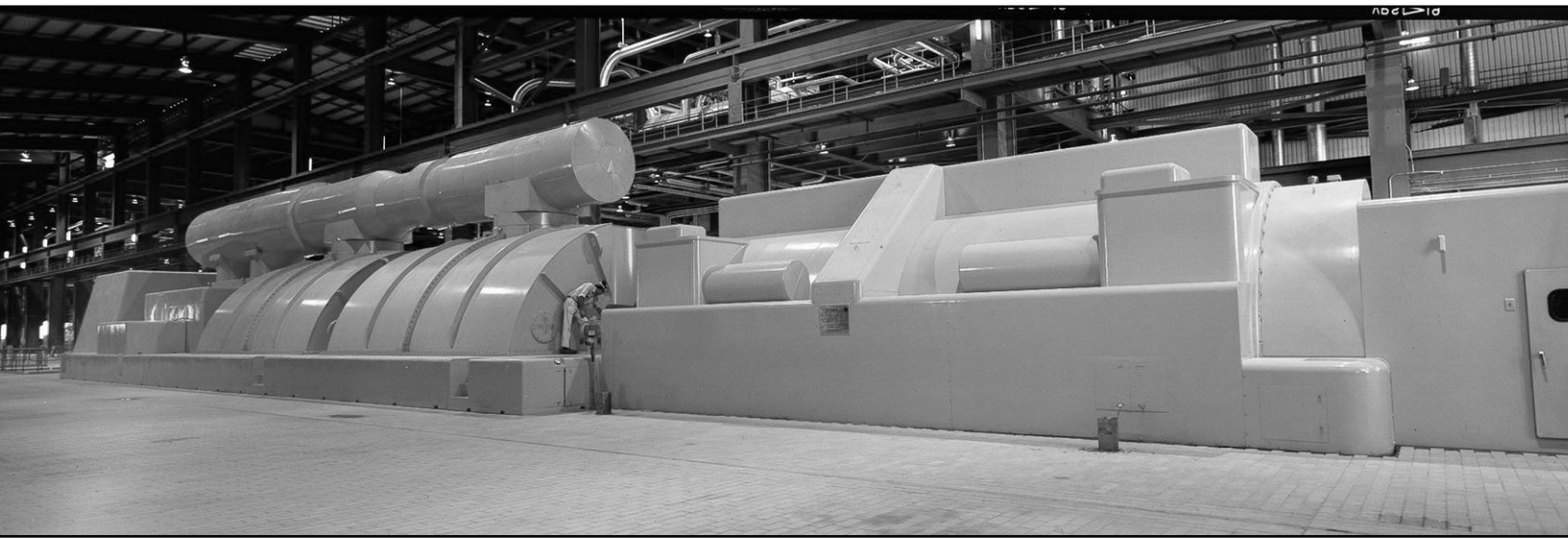


*Figure 92 (ECNSW)*



PACIFIC POWER



**Eraring** energy



origin

## CHAPTER 8 OWNERSHIP

### NSW State Government

Eraring has had two owners: the NSW State Government and Origin Energy, with the Electricity Commission overseeing it from its early days until 2000. Its trading name was changed to Pacific Power in 1992. The ECNSW/Pacific Power was dissolved in 2000, and its assets were transferred to a newly formed state government entity, Eraring Energy. In August 2013, Eraring and the Shoalhaven Hydroelectric facilities were sold to Origin Energy.

The following brief commentaries do not cover the full extent of each connection to Eraring.

#### *Electricity Commission of New South Wales*

*Elcom in the 90s and Partners in Performance: A Break with the Past*

The late 1980s and early 1990s were years of structural and cultural change for the Electricity Commission, including Eraring. These changes stemmed from generation overcapacity, the Commission's plans to construct even more capacity, and the recommendations of the 1986 Commission of Inquiry into Electricity Generation Planning in New South Wales.

"Elcom in the 90s," General Manager Barry Flanagan's title for his administrative reform initiative, targeted the organisation's structure and processes.<sup>48</sup> In an open letter to Commission employees in February 1988, Flanagan noted that the organisation's structure and many of its procedures were inappropriate for the then-current business environment.<sup>49</sup> He believed the Commission had to be structured to best meet the challenges of a changing social and commercial environment. The organisation had a strong engineering and electricity generation culture but a weak business focus.

With the release of 'Elcom in the 90s,' few outside senior management would have grasped the extent of the organisational and cultural changes the Electricity Commission was about to undergo. Employees had heard statements like "our structure and organisation must be appropriate for today's demands" or "change is inevitable" before. Yet over the following three years, the organisation underwent "strategic, incisive, and painful" organisational and cultural change.<sup>50</sup> Flanagan's change strategy was characterised by the need for urgent action on entrenched organisational values and culture.<sup>51</sup> A focus on power station construction had to be replaced by one mindful of the business imperatives of cost and efficiency.<sup>52</sup> This somewhat dramatic strategy aimed to eliminate reliance on outdated mindsets anchored in the past.<sup>53</sup> Prominent outcomes of this period were a flatter organisational structure, greater delegation of authority and responsibility, the decommissioning of redundant assets, improvements in operational efficiencies, and a highly visible and dramatic reduction in employee numbers. Many former employees reading this history would have left the organisation via the rolling Voluntary Redundancy programs initiated.

The entrenched organisational values and culture that "Elcom in the 90s" was attempting to transform were a function of those in senior management and those of the entire Electricity Commission workforce. Such values were partly a function of low staff turnover and the relatively specialised nature of power generation technology and operations. This was most evident in some regional areas with limited alternate employment opportunities in similar technical or engineering fields. While considerable staff movement was within the organisation, alternate employment in other power generation utilities required an interstate relocation. The relatively high pay and penalty rates also tied some employees to the ECNSW. Long-term employee stability was perhaps

best illustrated by the fact that it was not uncommon for a core of individuals on power station operating and maintenance work teams to remain together for a decade or more.

Flanagan also pointed out that the organisation could not continue using tariff increases to cover costs.<sup>54</sup> He argued that the organisation needed to focus on results, cost reduction, and improved utilisation of assets.<sup>55</sup> Peter Graham, the organisation's Personnel Manager, was also of the opinion that one of the major tasks of "Elcom in the 90s" was to reduce costs and that reducing staff numbers was a significant part of this exercise. In 1982, over 11,200 people had been employed. From 1981/82 to 1987/88, employee numbers fell by a relatively small seven per cent. In the next six years, staff numbers fell by nearly 5,000, or 45 per cent, due to natural attrition and targeted voluntary redundancies. Coupled with a 17 per cent increase in electricity sales over the same period, it equated to an increase in employee productivity (GWh/Employee) of over 70 per cent.<sup>56</sup>

While these dramatic movements in employee numbers and productivity are impressive, the term "improvement" would not have typified this period for many remaining in the organisation. Reduced staff numbers required changes in work practices and the reallocation of work responsibilities and priorities. Some Head Office staff commented that they had lost their sense of belonging and developed job insecurity.<sup>57</sup> In contrast, many power station employees, while acknowledging that redundancies were voluntary, seemed more concerned with the increased workload for those who remained than with job security.

As dramatic as these reductions in employee numbers were, the Electricity Commission was also mindful that relations with its employees needed to improve. With this in mind, an ambitious program of workplace reform was undertaken to develop a more flexible and mobile workforce. Launched in March 1989, the Training Efficiency and Multi-skilling (TEAM) Plan was also a response to the Commonwealth Government's Award Restructuring initiative.<sup>58</sup> The centrepiece of this process was a new Consent Award, which incorporated a single award covering all employees in six classifications, along with a simplified forty-point salary structure. This replaced four separate Awards, one agreement, 620 salary classifications, and a complicated 300-point salary structure.<sup>59</sup>

## *Pacific Power*

Culturally, the most dramatic change brought on by "Elcom in the 90s" was the change in the organisation's trading name. The new name, Pacific Power, reflected a symbolic turn from the past to reinforce the administrative and cultural changes. The executive viewed the name change as a visible expression to the organisation's own employees and external observers that an inward-focused engineering organisation was now one with a pronounced outward focus.

Structurally, however, the most visible outcome of the "Elcom in the 90s" period was the administrative reforms, which involved the creation, in 1991, of internal, cost-oriented, and in some instances competing business units. The Commission's organisational structure had been based on centrally controlled functional responsibilities for four decades. In the 1991 restructure, the seven power stations were broadly grouped into three business units based on their geographical location. Pacific Power Western incorporated Wallerawang and Mt Piper power stations, gas turbines, and hydro stations, as well as managed New South Wales's share of the Snowy's output. Bayswater and Liddell were part of Pacific Power Hunter, and Vales Point, Munmorah, and Eraring joined Pacific Power Central Coast.<sup>60</sup> Each regional generating business unit became responsible for many functions, including finances and human resources, which had previously been centralised Sydney-based functions. In terms of the centralised control of New South Wales electricity generation, Pacific Power remained the parent body. However, the generation business unit configuration, while an internal structural change, was the first intimation of the post-1996 disaggregated generation industry structure.

With the transfer of financial responsibility to business units in 1991, John Dyson recalls one issue this created for Pacific Power Hunter.<sup>61</sup> Under the previous arrangement, station management reported to the Assistant General Manager Production in Sydney. With seven power stations, Production Services, and Business Planning to oversee, this person could never be expected to delve deeply into the finances of each power station, let alone each group within each power station. He relied on the expertise of his station managers. From 1991, Jim Hennessy, as General Manager of Pacific Power Hunter, could apply what some may call a forensic examination to each station's finances and, in some instances, question expenditure on minor items of plant. For some Plant Owners, this proved a challenging development. If nothing else, introducing business units prepared managers, engineers, and plant owners for disaggregation and Macquarie Generation.

Similarly, the eight Transmission Centres throughout the state were condensed into three business units – Central, based in Sydney; Southern Region in Wagga Wagga; and Northern, based in Newcastle. Somewhat in parallel with restructuring, the Transmission division underwent considerable rationalisation of assets, with many 132kV transmission lines and substations in Sydney, Wollongong, and Newcastle, as well as various other lower-voltage assets around the state being transferred to the distribution Councils.

### *Aligning Employee Behaviours<sup>62</sup>*

The radical change process, implemented in "Elcom in the 90s" (1988-1992), while breaking with the past and refocusing the organisation on different goals, did not necessarily result in changes in employee behaviour.<sup>63</sup> Built on the successes of the earlier program's structural changes, the July 1992 "Partners in Performance" initiative aimed to develop employee behaviours appropriate for the new results-orientated business mode. As the vehicle to refocus employee behaviour, new General Manager Ross Bunyon proposed a team approach to his goal of industry

leadership.<sup>64</sup> While he acknowledged the advances of the "Elcom in the 90s" years, he was, however, aware that if the organisation was to remain the industry leader, continuous improvement in the management and operation of the organisation was required.<sup>65</sup>

As with "Elcom in the 90s", implementing many initiatives embodied in "Partners in Performance" had a basis in economic rationalist values. Employees were encouraged to become so-called owners of their part of the business. Pride in the technical, operational, and financial success of their team was envisaged to translate into technical, operational, and fiscal success for the organisation. These initiatives were augmented by personal development programs and the recognition and rewarding of excellent performance.<sup>66</sup> Workplace teamwork was evident in the form of self-managed teams, as was multi-skilling. The focus on outputs and results was clear in meeting the requirements of both internal and external customers through the application of continuous improvement initiatives and Total Quality Management concepts and tools. At Munmorah, for example, these initiatives were augmented by a Quality Service program.

### Disaggregation

Did disaggregation in 1996 mean as much to Eraring as it did to those at Vales, Munmorah, Bayswater, Liddell, Mt Piper, and Wallerawang? Probably not.

As with Pacific Power in 1994-1996, the seemingly sacrosanct model of monopolistic centralised ownership of state-owned large generating assets was broken, not by government decision, but rather by the public electricity utility itself. By January 2015, NSW had privatised a substantial percentage of its generation assets.<sup>67</sup> The Liberal Coalition government's success in the March 2015 State election confirmed that the partial lease of the high-voltage transmission network would proceed.

Treasurer Egan's 1995 comments, which seemed critical of Pacific Power, stemmed primarily from two areas. First, the previous Liberal NSW Government, mindful of the technical complexities of participation in a national market, chose to assign responsibility for implementation to the industry itself.<sup>68</sup> The government limited its involvement until Egan's appointment as Treasurer in April 1995 to less-than-robust policy development and coordination of the reform process. Second, Pacific Power management's natural desire to keep the organisation as a single entity, combined with its significant emphasis on commercial benefits, gave it an advantage when tendering for international energy service contracts.

Before 1996, the word most often quoted by Pacific Power senior management for the potential breakup of the organisation's generation portfolio was "balkanisation." In a geopolitical context, this term refers to the breakup of a state or region into several smaller, often competing regions. Pacific Power's General Manager and Chief Executive Ross Bunyon first used the term in June 1993 in response to the prospect of Pacific Power being disaggregated.<sup>69</sup> Bunyon argued that the breakup, or "balkanisation," of Pacific Power and other state-based utilities could increase costs because of the loss of economies of scale.<sup>70</sup> Bunyon's opinion of those proposing fragmentation of the industry is unmistakable. He believed that an "unholy alliance of vested interests, misguided bureaucrats and economic rationalists" viewed aspects of the liberalisation process as "sacred cows."<sup>71</sup>

Nevertheless, Bunyon conceded that competition between state-based electricity utilities and the removal of barriers to interstate trade in electricity could only benefit consumers. These benefits, however, were predicated on Pacific Power remaining a single entity. Size was crucial to Pacific Power's continuing strong commercial performance.<sup>72</sup> This strength is clear in indices such as the level of debt reduction and dividends paid to the government. Between 1990 and 1994, the

organisation's debt was reduced by \$1.3 billion, representing a 27% reduction and a 38% decrease from its peak in June 1988. Dividends paid to the government were equally impressive, totalling \$2.04 billion over the 1990-1994 period.

#### Disaggregation and Unions

Trade union opposition to disaggregation paralleled Bunyon's. Bernie Riordan, Secretary of the NSW branch of the Electrical Trades Union, noted that "if it ain't broke, don't fix it." The Association of Professional Engineers, Scientists, and Managers Australia (APESMA) had similar views. Opposition was also voiced at the workplace level. Two Construction, Forestry, Mining, and Energy Union (CMFEU) members echoed many of the arguments for an intact Pacific Power raised by Ross Bunyon. Superior business, operating, and environmental performances were cited as reasons not to disaggregate. They also envisaged that opportunities for technical cross-pollination between power stations would be minimised if not eliminated as each disaggregated generator took steps to protect its technical and intellectual properties.

With the transfer of Pacific Power's generation portfolio to Eraring Energy in August 2000, the government no longer considered the organisation a generating utility and no longer subject to the privatisation restrictions set by Labor policy. Accordingly, Pacific Power's subsidiaries were privatised. Powercoal was sold to the Centennial Coal Company in August 2002, and Pacific Power International (PPI) was acquired by Connell Wagner in February 2003. According to Treasurer Michael Egan, these sales made it clear that "Pacific Power [had] no remaining long-term operational activities and should, therefore, now be dissolved."<sup>73</sup> For the government, the financial consequences of the contractual dispute with Victorian distributor Powercor would be hidden within Eraring Energy, and it was the conclusion of a twelve-year program of extensive and successful reform. In his Second Reading of the Pacific Power (Dissolution) Bill, Egan briefly mentioned the history of the Electricity Commission and Pacific Power. However, it was clear that he and the government viewed dissolution in terms of the government's electricity industry reform agenda, be it significantly augmented by the organisation's tainted electricity trading performance.

#### The Demise of Pacific Power

Pacific Power senior managers may have reflected on the political influence and power they and the organisation once had. With the benefit of hindsight, they may have recalled that the decline commenced with the Liddell generator failures of the early 1980s or maybe the Generation Planning Review of 1986. The state and Commonwealth Government's commitment to a NEM in July 1991 may have been the catalyst. Referring to contestable consumers and the NEM in mid-2000, Acting Chief Executive Ralph Garland noted, "we have reached a position not envisaged by our founders." He may well have been commenting on what was to happen over the following three years. Robert Lang, the Acting Chief Executive tasked with closing down Pacific Power in 2002 and 2003, reflected that the organisation had "been the backbone of this state's social and commercial infrastructure." "Nevertheless, the closing down of this once successful organisation had long been foreshadowed [yet it] does not mean it will be any less emotional or easier for most of us. Feelings will likely range from sorrow, even anger, to pride and nostalgia."

While Treasurer Egan interpreted the end of Pacific Power as the culmination of a successful reform program, the opposition's Deputy Leader, Duncan Gay, saw it as the closure of "a chapter of financial mismanagement." For NSW politicians of all political persuasions, industry privatisation was not far from the main agenda, with the electricity industry no longer vertically or

horizontally integrated but still in public ownership. For the four public corporations that had once formed Pacific Power, its legacy remained in the plant and equipment each operated and maintained, as well as the people they employed. For the media that had daily reported the events of the Powercor case, the sale of PPI and Powercoal, and the vagaries of the NEM, the dissolution of Pacific Power warranted little mention.

For the Australian Greens' Lee Rhiannon, Pacific Power's demise was an anticlimax, a "sell-out of the Hunter region and a betrayal of power industry workers." For Jeff Hunter, the Australian Labor Party (ALP) Member for Lake Macquarie, himself a former Electricity Commission power station operator, it was "a very sad day."<sup>74</sup> In hindsight, as Robert Lang suggested, the breakup and demise of Pacific Power had been a long-drawn-out exercise.<sup>75</sup> For those employees who transferred to TransGrid in 1995 or to Macquarie Generation and Delta Electricity in 1996, their allegiance increasingly shifted to their new employer. Any lingering connection with Pacific Power would more than likely have been at a nostalgic level. Many, now exposed to a new, more demanding corporate life, may have looked nostalgically back to a calmer time in Pacific Power. Similar feelings may have been evident for those who transferred to Eraring Energy in 2000. For many who transferred to the new public generators, the payout of unused long-service leave entitlements likely eased the pain of the transfer.

### ***Eraring Energy***

In 2000, Eraring Energy inherited the thermal, hydro, and wind assets of Pacific Power.<sup>76</sup> This also included the Pacific Western subsidiary, which operated and maintained Collie Power Station in Western Australia.

In the early 2000s, it is unlikely that many at Eraring gave much thought to the demise of Pacific Power. Transfer to Eraring Energy was not accompanied by thoughts of retrenchment or even the offer of voluntary redundancies. The mood at the station was, for some, brightened by the appointment of a new Managing Director. Gerry Grove-White brought a fresh approach to the NSW power industry, backed by many years of international experience. Grove-White's deep commitment and passion for safety empowered people to improve Eraring's culture and systems.<sup>77</sup>

Pacific Power's generation assets were transferred to Eraring Energy in August 2000 as part of the NSW Government's Electricity Reform process. Eraring Energy became a diverse generator with existing coal, diesel, hydro, and wind assets totalling over 3,100 MW.

It is perhaps speculative to reflect that, but for the Powercor issue, Pacific Power would have remained as the third NSW electricity generator and divested itself of its non-core subsidiaries. Nevertheless, fifty years of service in providing a vital commodity to the state had come to nothing. A proud tradition was sacrificed to the neoliberal dictates of consumer choice and business and production efficiencies. For electricity consumers of NSW, the demise of Pacific Power meant little. For ex-employees, it may have been a time for nostalgic reflection.

### ***GenTrader***

Prior to March 2011, Eraring Energy's income was derived from its participation in the electricity market. As part of the NSW Government's electricity reform process, Eraring Energy was directed to enter into a contract with Origin Energy, which would hold the trading rights to the output of Eraring and Shoalhaven Power Stations.<sup>78</sup>

## **Origin Energy**

On 1 July 2013, Origin Energy took a significant step by announcing its intention to acquire Eraring Energy. This strategic move was executed through a Sale and Purchase Agreement with the NSW Government that was completed on 1 August 2013.

Many individuals within the Eraring workforce would have pondered the motives behind the NSW Liberal Government's decision to enable this acquisition. While some speculated that it was primarily for advancing new state infrastructure, NSW Treasurer Mike Baird clarified that the agreement with Origin aimed to mitigate the extensive liabilities inherited from the previous Labour government's problematic GenTrader electricity deal.<sup>79</sup> He emphasised that the state would bear a net cost of approximately \$75 million, saving the state from liabilities exceeding \$1.75 billion attributed to the State Labor's GenTrader agreement.



*Figure 93 First Aid competition*



*Figure 94 Pacific Power's 1996 Annual Report cover celebrating Unit 4's world record  
(Pacific Power)*

## CHAPTER 9 PEOPLE AT ERARING

Power stations are often celebrated for their technological achievements, but for those who worked at Eraring, it is the people, their stories, and their camaraderie that define its essence. The station's history is not just about machines and megawatts; it's about the lives intertwined with its success.

### Journeys Through Eraring: Attraction and Legacy

Eraring's history is inextricably linked to the stories of those who built, managed, operated, and maintained it. Interviews with over 80 individuals revealed a recurring sentiment: Eraring wasn't just a workplace but a defining chapter in their lives. Many recalled their reasons for joining, what kept them there, and their journeys afterwards.

### Why Did People Choose Eraring

The decision to work at Eraring was influenced by career ambitions, personal circumstances, and the allure of a cutting-edge power station. Each story reflects a unique motivation.

#### Career Growth

For many, Eraring represented a career-defining opportunity. Dave Williams, a seasoned leader from Queensland's Gladstone and Tarong power stations, was drawn to Eraring's scale and prestige, taking on a managerial role. Similarly, Geoff Byrnes left Munmorah to seize a promotion at Eraring, enticed by its reputation as a technological marvel.

Adela Murphy, after years in Pacific Power's Sydney office, sought a hands-on role and transferred to Eraring, shaping a career that spanned 19 years. She described the move as a bold step toward achieving her professional goals.

#### Learning Opportunities

Eraring was a beacon for those eager to grow. A young chemical trainee, just 20 years old, jumped at the chance to work in science, saying, "I saw the advertisement, and I knew this was it." Diane Moriarty, studying finance at the University of Newcastle, found Eraring to be the perfect place to bridge theory and practice.

Fred Seysener, an innovator, relished the opportunity to pioneer a computer system at Eraring, blending technical skill with creativity. "It wasn't just a job—it was a challenge that pushed my limits," he shared.

#### Technical Challenges

For tradesmen, engineers, and operators, Eraring was the pinnacle of engineering. Dave Tod, an electrical draftsman, saw it as a chance to work at "the newest, biggest, and best in Australia." Laurie Thompson, was drawn to the opportunity to contribute to a state-of-the-art facility.

Timekeeping Supervisor Michael Wright, joined from Munmorah, described his first day as "like stepping into the future—everything was bigger, better, and more advanced."

### Proximity to Home

The station's location near Lake Macquarie appealed to many. Laurie Thompson enjoyed a short commute and stayed for 37 years. Neil Morris, fascinated by the station's advanced 660 MW units, appreciated being close to family while pursuing his engineering passion.

One tradesperson, tired of commuting to Sydney, found Eraring's proximity to home life-changing. "It was a relief," he said, "to work so close to where I lived."

### Apprenticeship Opportunities

Eraring's apprenticeship programs attracted young talent. Brett Murphy, Michael Wheelahan and Troy Locke joined as apprentices and later transitioned into senior engineering and operating roles. "It was a place where you could grow," said Brett. "You weren't just learning a trade—you were building a career."

### Exciting Work Environment

For some, Eraring's dynamic environment was irresistible. Initially content at Munmorah, one operator described being captivated by the "well-laid-out charm of the Big E."

Fred Seysener reflected on the station's construction days: "The chance to be part of building something this significant doesn't come around often. It felt like history in the making."

## Tenure: Lifetimes of Dedication

The dedication of Eraring's workforce was extraordinary. Many employees spent decades there, forging careers filled with pride and accomplishment.

- Laurie Thompson: 37 years at Eraring, after 12 years at other NSW power stations, made him a cornerstone of the station's history.

- David Tod: 31 years as an electrical draftsman, overseeing innovations and system improvements.

- Neil Harvey: 32 years as an environmental officer, instrumental in installing the Water Reclamation Plant.

- Fred Seysener: 26 years of technical leadership in computer systems.

- Greg Johnstone ("Sooty"): 20 years as an operator retired to travel and enjoy life.

Their stories exemplify the loyalty and pride that defined the station's culture.

## Why People Left

When the time came to leave, reasons ranged from redundancy and retirement to personal and professional transitions.

### Redundancy and Restructuring

Several individuals left on voluntary redundancy packages. One person made redundant reflected, "It was bittersweet—leaving a place that gave me so much, but knowing it was time for a new chapter."

### Retirement

Retirement offered many a chance to explore life beyond work. Dave Williams retired after a decade as Station Manager. Greg Johnstone embarked on travel adventures and embraced hobbies and motorcycle tours.

Laurie Thompson, after 37 years, described retirement as “a well-earned rest but with a deep fondness for the place I called home.”

#### Career Changes

Some left to pursue new challenges. Diane Moriarty joined Macquarie Generation in a senior finance role, and Peter Smith accepted a managerial position at Munmorah Power Station.

#### Personal Reasons

Family and health influenced decisions, too. One maintenance worker left to care for aging parents, while another pursued a passion for restoring classic cars.

### Life After Eraring

Following their departure, employees took diverse paths, showcasing their adaptability and ambition.

- Adventure and Travel: Neil Harvey explored Australia in a caravan while other retirees cruised the Rhine and Canada’s Inside Passage.

- Second Careers: Michael Wright shifted to long-haul driving before becoming a tour bus operator. Jamie Bradley became a foreman at Caterpillar after a stint as a FIFO contractor. Mark Finlay worked in interstate and international power stations, mainly in a commissioning role. Mark reflected that the expertise gained at Eraring generally exceeded that found in similar international organisations.

- Community Service: Ian Dawson dedicated himself to volunteer work, reflecting Eraring’s culture of giving back.

- Kate Coates became General Manager at AGL Macquarie (Liddell and Bayswater).

- Ken Thornton returned to university studies, wrote a history of the Electricity Commission, and then histories of Munmorah, Liddell, and now Eraring.

### Memories That Define Eraring

Many former and current Eraring employees were interviewed for this history. One of the questions asked was, “What three words or phrases best describe your Eraring experience?” Their responses reflect professional pride, personal growth, and a strong sense of community spirit. The frequent mention of terms like “fantastic people,” “great learning experience,” and “community-focused” underscores a collective sense of accomplishment and a strong sense of belonging. Additionally, descriptors such as “challenging,” “innovation,” and “technical excellence” highlight the technical and professional rigour associated with working at Eraring. Emotional connections are evident through words like “family,” “friendship,” and “respect,” indicating a deeply personal investment in the workplace. The narrative these responses weave together is one of a dynamic, fulfilling environment where both personal and professional growth are nurtured, underscored by a strong sense of unity and purpose.

Eraring’s history is rich with memorable moments, from the humorous to the heroic.

- Collective Achievements: Employees took pride in milestones such as Unit 4's late 1996 world record for 674 consecutive days of continuous operation, a testament to teamwork and expertise.

- Norm Whipp (Shift Manager) recalls that in the mid-1980s, he could have had someone on his shift suffer a red-bellied snake bite in the meal room!<sup>80</sup> One of his operators was down "inspecting" the CW screens one night shift when he noticed a snake with its head stuck in a soft drink can that had come up on a rotating screen and landed in the sluice trough along with the occasional prawn and other debris. Intrigued as to why this snake had drowned in such a manner, he brought it back to the PCR meal room to show the other folks. The unfortunate snake was withdrawn from the can, where, upon inspection, a dead mouse was found. The crew formed the opinion that the snake had chased the mouse into the can but jammed its head in the can. Snake and mouse had ended up in the inlet canal to the rodent's and reptile's demise.

Duty must have called because the occupants went out on the plant and left the animals and the can in the sink for later disposal. Someone returned to the room sometime later and discovered that the mouse had been the only fatality in this story. Alan "Fitzie" Fitzgerald's skills as a snake handler were pressed into service, and all's well that ends well. However, Norm did wonder later in the shift, when told the story (which did not make it into the Shift Manager's log), how he would have handled the paperwork in the case of snakebite or if the snake had disappeared within the PCR complex.

- Bob Porter (Engineer- early 1980s) recalls the unfortunate death by asphyxiation of the two chemists was a tragic episode in the early life of Eraring, with a major investigation into the cause of what appeared to be a benign situation and the rapid development of enhanced confined space procedures throughout the industry (and beyond). He was also involved in establishing the Sports and Social Club and the Mortality Fund. The construction, commissioning, and establishment of commercial operation of the four Eraring Units in a short time interval was a remarkable and noteworthy accomplishment, attributable to the expertise within the Electricity Commission that had been developed over the '50s, '60s, and '70s. (Bob commented that he still has his work diaries from that period.)

## Reflections on Eraring

Eraring was more than just a power station—it was a marvel of engineering, a source of pride, and a community united by a shared purpose. For many who worked there, it represented the pinnacle of their professional lives, where excellence wasn't just pursued and achieved. The station stood as a testament to what could be accomplished with determination, skill, and collaboration, often referred to as the "Rolls Royce" of power stations.

Walking through its gates, one could feel the hum of something extraordinary. It wasn't just the machinery—it was the people who gave Eraring its soul. Colleagues weren't just coworkers but friends and, often, family. Lifelong bonds were formed over long shifts, challenging projects, and moments of triumph. The camaraderie was the foundation of the station's culture, a glue that held together teams of highly skilled, competent, and confident individuals.

The work at Eraring was dynamic and demanding. Every day brought new challenges, whether ensuring safety, managing environmental risks, or striving for technical excellence. Yet, these

challenges were met with resilience and pride. Employees learned not only to solve problems but to innovate, growing in ways they often didn't fully appreciate until they ventured beyond Eraring to other industries or even overseas. The training was exceptional, and the lessons learned stayed with people for life.

The station's early years were filled with excitement and energy as construction and commissioning pushed boundaries and inspired awe. The middle years were characterised by hard work and demanding operations, while the later years brought difficulties, including redundancies and shifting priorities. Through it all, there was an unwavering focus on the mission: keeping the lights on for the people of New South Wales.

For many, Eraring wasn't just a job but a privilege. It was a place where achievements were celebrated, friendships were cherished, and careers flourished. Employees reflected on their time there with gratitude, describing it as the best experience of their working lives. Despite the challenges and frustrations that inevitably came with such a massive operation, the prevailing memories were of pride, satisfaction, and a sense of belonging.

Yet, perspectives varied. For some, Eraring was simply a means to earn a living. "It wasn't a passion, but it paid the bills," one tradesman admitted. These contrasting views add depth to the station's narrative.

Today, Eraring is remembered as more than a workplace—it is a legacy. It lives on in the stories, skills, and relationships of those who were part of its journey. From the early days of innovation to the later years of resilience, Eraring remains a symbol of excellence, community, and shared purpose. This power station was truly, as a senior manager put it, "as God intended."

Eraring's legacy lies in its people—their stories, contributions, and sacrifices. Everyone shaped its success, from engineers solving complex problems to operators ensuring smooth operations.

As the station transitions into a new era of energy, its history serves as a testament to human ingenuity and resilience. For those who worked there, Eraring will always be more than just a power station—where lives were lived, friendships forged, and milestones achieved.

## **Are You a 'Power Station Tragic'?**

Do you find yourself deeply fascinated by power plants? If so, you might be a "power station tragic." This unique passion stems from the intricate workings, historical significance, and technological marvels of facilities like Eraring, captivating those who appreciate their multifaceted impact.

Power plants are engineering marvels featuring complex machinery like turbines, generators, and cutting-edge control systems. Enthusiasts are drawn to the precision and innovation behind power generation, marvelling at the technical expertise required to run these massive systems.

On the human side, camaraderie is the foundation of a station's culture, a glue that holds together teams of highly skilled, competent, and confident individuals.

Beyond technology, power stations hold immense historical significance. They've powered industries, cities, and economies for over a century, vital in shaping modern life. Understanding their development offers insight into industrial growth and societal transformation.

Their design adds another layer of intrigue. While many power stations, such as Eraring or Mt Piper, are functional in appearance, earlier facilities like Wangi combine form and function, featuring brick facades and design aesthetics that appeal to those who appreciate architectural beauty.

Power plants often face criticism for their environmental impact in an era focused on sustainability and net zero aspirations. Yet, for some enthusiasts, this challenge becomes an opportunity to explore and advocate for greener energy solutions or study the transition from traditional coal-fired stations to modern, sustainable energy models.

The preservation of historical power stations is another passion for these individuals. Sites like White Bay Power Station in Sydney, constructed between 1912 and 1917, highlight this effort. Decommissioned in 1985, it retains key features, like a turbine generator, as a testament to its past. In 2021, the NSW Government committed \$100M to its remediation and conservation. This funding aimed to restore and adapt the historic structure for future cultural and civic purposes.

Community plays a significant role in this fascination. Enthusiasts often connect through forums, social media groups, and in-person gatherings, such as the “New Eraring Champions” Facebook group and monthly meetups of former Eraring employees. These groups offer opportunities to share knowledge, exchange stories, and reminisce about the heyday of these iconic stations.

For some, nostalgia drives their interest, recalling when power plants were central to their local communities and livelihoods. These memories fuel a deeper appreciation for their historical and cultural importance.

In summary, being a “power station tragic” is about more than just an interest in machinery. It’s a passion driven by a blend of technological wonder, historical appreciation, architectural interest, and a sense of community, making power plants an enduring source of fascination.

## Celebrations

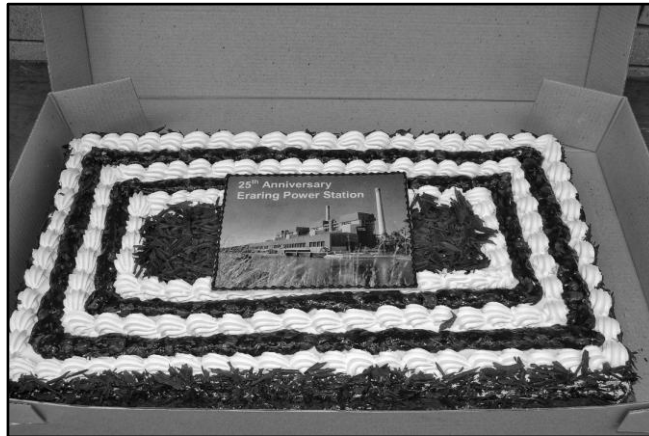


*Figure 95 25<sup>th</sup> anniversary (unit 1), 2007*



*Figure 96 30<sup>th</sup> anniversary (unit 1), 2012*



*Figure 97 40<sup>th</sup> anniversary (opening), 2024/ 2025 (Origin Energy)  
 Dan Repacholi MP (Federal Member for Hunter), Yasmin Catley MP (Member for Swansea), Steven Rigby  
 (General Manager Generation and Energy Transition Origin Energy), Greg Piper MP (Member for Lake  
 Macquarie), Greg Jarvis (Executive General Manager, Energy Supply and Operations at Origin Energy)*

## Fiction based on facts.

Ken Thornton

Geoff Turner, a long-time Power Plant Operator (PPO), oversees two of the power station's 720 MW generating units. Before the sun rises, Geoff's alarm jolts him awake, breaking the tranquillity of his suburban home. Beside him, his wife stirs briefly before he silences the alarm. After sharing a quick chat over coffee in the kitchen, Geoff dons his Hi-Vis orange work attire and grabs breakfast. The soft glow of the porch light fades as he heads out to his car, waving goodbye to his wife, who stands at the door.

Upon entering the power station, the roar of steam flowing in pipework, whirring motors, pumps, fans, and humming turbines greet Geoff. The dim control room, adorned with rows of high-tech monitors, is the nerve centre of the station. Geoff greets Joe, the PPO he is relieving, and they discuss the state of the two generating units. "Unit 1 is on its way to 700 MW; I placed the sixth mill in service five minutes ago," Joe comments. "Unit 2 is OK." As Joe leaves the control room, Geoff overhears an outgoing Assistant Power Plant Operator (APPO) jokingly tell his relief, "Good job, check everything!" Geoff is about to comment but refrains, as he had done the same on occasions when he was an APPO.

Geoff's first order of business is to familiarise himself with each unit's status: load, load settings, mills in service, fans in service, condensate pump in service, and feed pumps in service. He also checks which major items are not in service, why, and what the Trading Team in Sydney has planned for his two units. He needs to know if he will have to make mill changes later as each unit's load is controlled by the Traders and if the unit is on Frequency Bias duty.

Geoff's role shifts from active intervention to vigilant oversight as the day progresses. The Integrated Control and Monitoring System (ICMS) can efficiently manage most processes, but human intuition remains vital. Geoff's experience and expertise allow him to interpret data nuances that automated systems might overlook. Nevertheless, Geoff is mindful that his days in charge of two units are not always this peaceful. Last week, on 'nights,' one of his units was out of service with a boiler tube leak and in the early stages of being returned to service. Then, about halfway through the shift, the Traders advised that a 'window of opportunity' had opened up to allow his other unit to be taken out of service to repair an early Economiser tube leak detected by the boiler anomaly detection system. Luckily, there was a third PPO in the control room.

At midday, Geoff's attention turns to the environmental controls. The power station is committed to minimising its ecological impact. The Fabric Filters are just one of the main parts of the station's systems that work to reduce emissions. Geoff fine-tunes these systems, ensuring the air leaving the plant is as clean as possible.

About eight hours into the shift, a notification blips on one of Geoff's screens. A minor problem has been detected in the Auxiliary Cooling Water (ACW) system on Unit 1, potentially jeopardising the unit's operation. Despite the late hour, Geoff springs into action. He engages his troubleshooting skills, consulting the system logs and running diagnostic tests to pinpoint the issue. Within an hour, he and an APPO have rectified the problem, averting a potential disaster.

As the shift wears on, Geoff's exhaustion is unmistakable. Some shifts are easy; apart from running at minimum load during the day and increasing load in the late afternoon toward the evening peak, nothing much happens. Apart from the earlier ACW problem, there hasn't been much activity. Still, today, a blocked coal feeder on Unit 1 and limitations of FD and ID fans resulted in a load restriction to 680 MW on Unit 2 for a few hours. The Traders had been notified

but insisted they be told when the unit was again available for full load. Yet, despite these and other issues, Geoff feels it has been a reasonable shift. There have been no 'stuff-ups.'

At 6:50 pm, Geoff hands over his job to the next PPO. Before going home, he exchanges a tired smile and a few words about an issue on 2B PF Mill. When he arrives home, his wife greets him with a warm hug, and the sound of their dog barking in the backyard adds a sense of comfort. Over dinner, Geoff recounts parts of his day, careful not to delve too deep into the technical challenges, and listens to his wife share her experiences.

Later, as he crawls into bed, Geoff tries not to think about work. Thankfully, the nights of waking up worrying about a work-related issue are now a thing of the past. Currently, the plant is under someone else's responsibility. Anyway, it will be there when he returns tomorrow.

The transformation of Eraring into an example of automated efficiency has not diminished the importance of skilled human operators. While technology has taken centre stage, people like Geoff, with their dedication, adaptability, and experience, ensure the station's smooth operation.

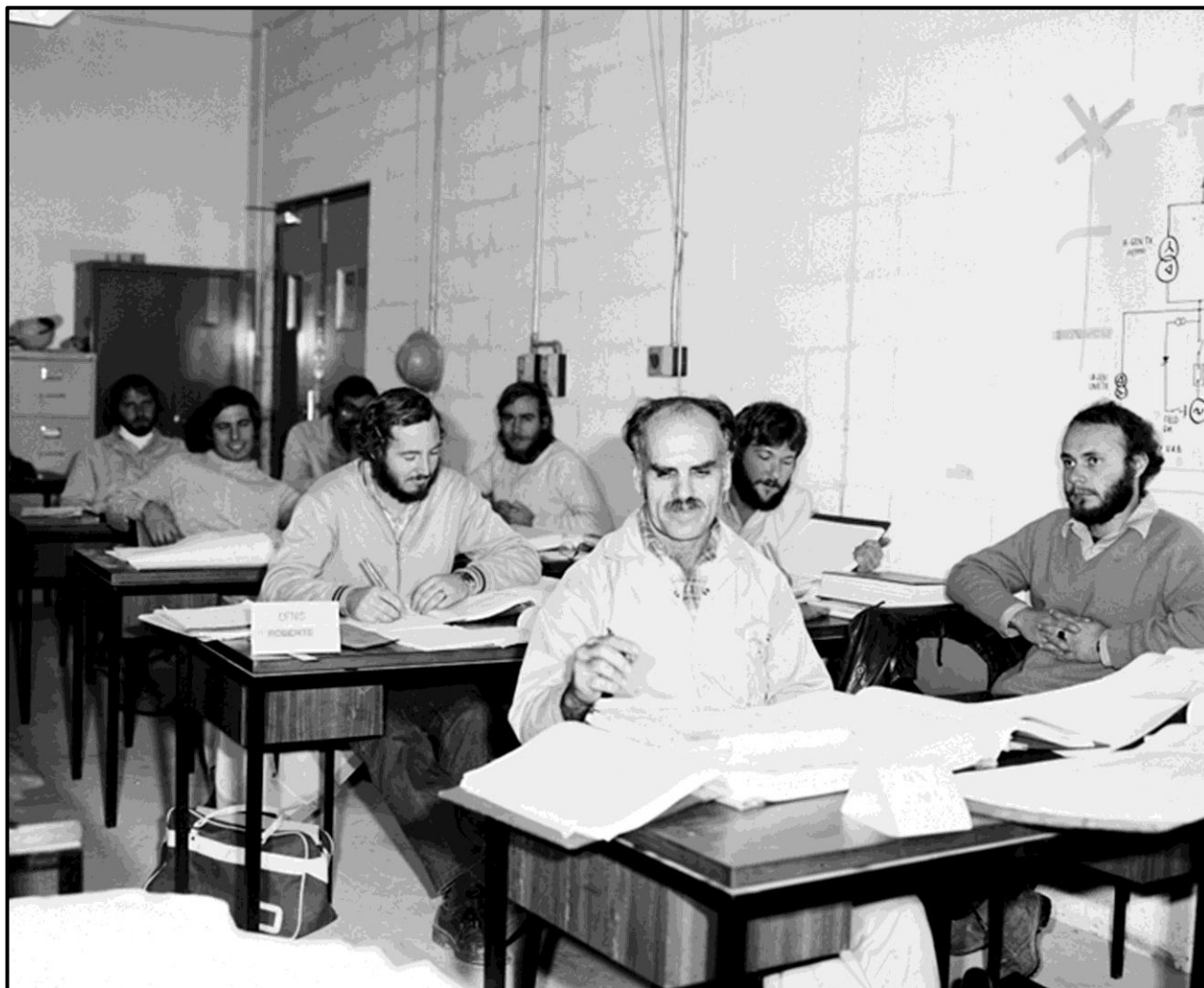


*Figure 98 Assistant PPO training school, August 1981  
(ECNSW 13427)*

## Gerry Grove-White: A Pioneer in Safety and Transformation at Eraring Energy



(Pottinger 2023)

Gerry Grove-White, a seasoned professional, played a pivotal role during the formative years of Eraring Energy as its Managing Director from 2001 to 2006. Gerry was well-prepared for the challenges ahead with extensive experience in the energy industry, including his prior position as the Country Manager (India) for PowerGen plc, a UK electricity and gas provider.

Before joining Eraring Energy, Gerry faced a critical turning point in his career when PowerGen plc shifted its focus to North America, leaving him facing redundancy. However, this setback led him to discover an opportunity in New South Wales. A government-owned electricity generator was searching for a leader with Gerry's expertise in electricity trading and derivatives, although the exact nature of the challenges was not explicitly disclosed.

In December 2000, Gerry attended a strategy presentation by Price Waterhouse Coopers, where the inherited Trading Book of Eraring Energy was discussed. This presentation shed light on the magnitude of the task before him. It was revealed that Eraring Energy had inherited a staggering 'mark-to-market' valuation of minus \$1.5 billion.<sup>81</sup> This valuation, a reflection of the contracts inherited from Pacific Power, added a substantial burden to Gerry's responsibilities.

The origin of this burden can be traced back to the fallout from Pacific Power's 1999 dispute with Victorian electricity retailer Powercor Australia. Pacific Power had sold too many contracts and was attempting to back out of some of them. There was an underlying assumption in Pacific Power that the price between New South Wales and Victoria would never differ. They generated electricity in New South Wales, believing their contracts in Victoria would be covered. However, they completely ignored that Snowy Hydro was sitting in the middle, profiting by separating the prices.

The court ruling favouring Powercor had far-reaching implications, not only for Pacific Power but also for Eraring Energy. The lack of robust and transparent procedures in Pacific Power's energy trading process was exposed, leading the NSW government to lose confidence in Pacific Power's ability to navigate the National Electricity Market. Consequently, Eraring Energy emerged as a state-owned corporation in 2000, with Gerry at the helm.

Within four years of Gerry's arrival, the trading team under Stephan Boras received prestigious accolades, including 'Spot Trader of the Year' for two consecutive years and 'Contract Trader of the Year.' These achievements stand as a testament to their dedication to excellence.

Gerry's commitment to safety became a defining characteristic of his leadership at Eraring Energy, influenced by his personal experiences and the lessons learned throughout his career. Years before joining Eraring, Gerry had witnessed the tragic loss of three employees in workplace incidents. The profound impact of those incidents, particularly the agonising meetings with the families of the deceased, shaped Gerry's unwavering dedication to safety.

Under Gerry's leadership, the safety culture at Eraring Energy experienced a transformative shift. He emphasised prioritising safety above all else, encapsulated by his mantra, "Nothing is so important that it can't be done safely!" Initially met with scepticism by the workforce, Gerry's resolve was tested when a potentially hazardous situation arose on a Sunday afternoon. Unit 4 had developed a large clinker bridge at the boiler throat, and an unsafe method was being considered to address the issue. Gerry swiftly intervened, insisting that the unit be immediately removed from service. His decisive instruction spread throughout the power station, leaving no doubt that Gerry's commitment to safety was genuine.

One of Gerry's notable contributions to safety was the implementation of lockout procedures. Recognising the need for improvement in making the plant safe to work on, he challenged the Safety Committee and management to assess their existing practices. A significant transformation was required. Drawing on his extensive experience in power stations, Gerry spearheaded the development and implementation of robust lockout procedures, ensuring that safety was ingrained in every aspect of Eraring Energy's operations.

The journey toward implementing a lockout system at Eraring was not straightforward. It highlighted the importance of a fresh perspective from a manager or supervisor with a different career journey. In an early Safety Committee meeting, the discussion centred on an isolation incident on a Condensate Pump. After much debate, Gerry observed, "If the safety rules are so good, why did this incident happen? How good are the rules?" The unanimous reply from Committee members was, "We are the best. We have been doing this for decades!" Gerry challenged them, saying, "If that's the case, go and prove it." This led to benchmarking visits to various Australian states, the UK, and Hong Kong. The outcome was the introduction of the lockout system in the early 2000s. Gerry's experience guided him to believe that people had to believe in the magnitude of such an exercise for it to be successful. It's about ownership. The benchmarking visits played a crucial role by giving the workforce ownership of their environment and the things around them. The rest is history.

Gerry's impact on safety at Eraring Energy extended beyond these instances. His relentless pursuit of a safety-first culture and his unwavering commitment resonated with the workforce. Today, reflecting on Origin's ten-year tenure, those who remember the early years of Eraring Energy see it as a transformative period under Gerry's leadership. His unwavering commitment to safety and his actions propelled Eraring Energy towards a culture of excellence, ensuring the well-being of its employees. Gerry's legacy continues to inspire future generations of energy leaders to prioritise safety as a non-negotiable aspect of their operations, forever shaping the history of Eraring Energy.

When asked his opinion of Eraring, Gerry replied, "It is a power station as God intended, when engineers, not accountants, were in charge when the plant was designed." He believed that the power station had a life of its own, a soul, and the people made it a living entity.

Many people have wondered why Gerry left Eraring Energy. He had tried to convince the NSW Government to merge Eraring Energy with Integral Energy to create a GenTrader, but they refused. He was deeply disappointed, and ultimately, he believes he had "exhausted the challenge."

## **My Dad**

Niamh Francisco, Year 10 Work Experience Student, September 2023.

Eraring was a highly discussed topic in the media for several weeks in late August and early September 2023. But behind the scenes of Eraring, numerous teams ensure that New South Wales is supplied with power. Among these is Corey Francisco's Ash Dam team. Corey is my dad.

For nearly three and a half years, he has devoted nearly every day of every week to his role as the Ash Dam Operations and Maintenance Manager, and in his own words, he has "loved every minute of it."

My dad's role means that he oversees the operations of the Ash Dam and the well-being of his team. At the Ash Dam, over 60 dedicated employees can be found, with various jobs including Excavator and Ground Crew. This is a far cry from the Ash Dam my dad first saw in 2020 when it only had around 15 employees.

His journey from being a supervisor on the Southern Embankment Stabilisation project to the Ash Dam's Operations and Maintenance Manager proves his strong drive to work and achieve. Before working at Origin, my dad was a Shot Firer (a person who fires a blasting charge, typically for mining) and a Ground Engineering Manager with a company that stabilised ground after events such as sinkholes, earthquakes, or tsunamis.



*Figure 99 A portion of the Ash Dam. The mound in the centre is stockpiled ash being prepared for sale.  
(Corey Francisco)*

Many people, especially those who have not been inside a power station before, may be unaware of the purpose of an Ash Dam. Ash dams store waste ash, a by-product of coal used for electricity generation. A common question about the Ash Dam is, "How does the ash get there?" An intricate pipe system transports the ash from within the power station all the way to the ash dam, which is over 700 metres away. The pipes ensure no ash enters the air, leaving the Lake Macquarie area with fresh, non-polluted air and water. In fact, Ash Dams are designed specifically to prevent the

release of ash into the environment, protecting air and water quality. They are heavily regulated and endlessly maintained to ensure that they meet environmental standards.

I was lucky enough to spend a week at Eraring for work experience. I spent an hour or two with my dad every morning as he conducted checks on employees and surveyed the Dam. I spent the rest of my day with the Information Management Team (IM). During this time, I witnessed firsthand the dedication that employees show. During our daily drives to and from work, my dad would tell me how important it is for the public to understand the tireless work that goes into maintaining the power station and Ash Dam, ensuring a long and sustainable life, perhaps even after Eraring closes.

The knowledge I have gained in these past five days is immeasurable. Without even realizing it, I have learned the workings of the Ash Dam, the power station itself, the cooling water system, and the famous inlet to the Myuna Tunnel. I have also learned skills from the IM team, such as sorting, archiving, storing hard copy documents, and scanning documents, even some 140 years old.

Caring for the environment is one of the driving factors behind my dad's work. He spends countless hours surveying the waterways surrounding the Ash Dam and creating a nature strip around the Ash Dam that is filled with native trees and vegetation for wildlife.

Sustainability is significant at home and work; we are always trying to find ways to create the least waste and have the least negative impact on the world around us. A recent project that the workers at the Ash Dam have undertaken is creating bricks and cement from the ash, a useful by-product produced from the production of electricity. To put it simply, when coal is burned, it creates ash. To stop the ash from polluting the air and waterways, it is stored in the Ash Dam and used for industrial 'capping' (filling mine voids and tailings dams).

Two of my dad's passions have found a home at Eraring: piloting drones and caring for his team. His drone is used to survey the Ash Dam to detect fluctuations in the levels of various dam cells. He also surveys the coal stockpile to detect spontaneous combustion, which is invisible to the human eye. My dad and his team's efforts prove that behind every megawatt of electricity, there is a team of people hard at work throughout all hours of the day and night to provide the east coast of Australia with energy.



*Figure 100 Boiler Electrical Maintenance Team*  
*From left, Dave Joyce, Ken McEwen, Wal Wrigley, Trevor Russell, Darcy Obree, and Peter Hopkins.*  
 (ECNSW)



*Figure 101 Operation Support*  
*Back Row: Kevin Grey, Fred Seysener, Julie Virtue, Raja Ratnam, Ash Baweja, Ian Gardner, Ross Milne, Neil Simpson, Paul Collier. Front Row: Warwick Scholes, Roy Evans, Tom Hinchliffe, Peter Phillipson and Dave James.*

## Chinese Operators at Eraring

An extract from *Network* June-July 1990.<sup>82</sup>



Figure 102 Chinese Operators from Beilungang Power Station, March 1990  
(ECNSW 140541)

*"You're lucky you live here."*

*"Sydney is a clean, open city."*

*And with such candid observations in early 1990, 16 power plant operators from China settled down to the first day of a four month training program with the Commission.*

*For most of them, the trip to Australia in early March was the first time they had ever been overseas.*

*Their arrival completed two years of direct negotiations between Eleam Services, a Electricity Commission subsidiary, and the Zhejiang Provincial Electric Power Bureau for operators to be trained in New South Wales.*

*Zhejiang province is installing two 600 MW coal-fired units at its Beilungang power station. About 150 km south of Shanghai, using technology similar to that at Eraring. It was only logical for its key operators to train with the Commission.*

*The \$800,000 training contract was funded by a World Bank loan to China.*

*The operators were training at Lake Macquarie Training Centre and Eraring and Bayswater power stations.*

*They were all college graduates. Some having reached college graduate level in both mechanical and electrical engineering. They have had experience in generating plants of up to 300 MW capacity.*

*In 2022, the Beilungang plant comprised three 600 MW units plus 1,200 MW of additional plant, making it the largest coal-fired plant in China.<sup>83</sup>*

## **People at Eraring – May 2023**

It's hard to tell who works for whom when everybody wears orange hi-vis work clothes. The logo on their shirts is the best way to know. Origin staff, maintenance workers, operators, engineers, technicians, and administrators all wear the same clothes.

Power Plant Operators (PPOs) quietly monitor their respective units in the control room. Assistant Power Plant Operators (APPOs) may be inspecting their area of responsibility on the plant. They may be making the plant safe for maintenance work or, in the control room, ready to respond to a PPO request to initiate an activity on the plant that cannot be done from the control room.

In the past, APPOs inspected their part of the plant regularly, often more than once per shift. However, with the introduction of the Distributed Control System (DCS), remote reporting of plant parameters has overtaken physical inspections for some operators. In recent years, a mobile phone app called DORIS has been implemented to assist APPOs in their plant inspections.

With Unit #2 out of service for a major overhaul, there are generally over 500 contractors on site. On the operating floor, the top half of all the turbine cylinders have been removed. The Low-Pressure Turbine rotors are visible in their bearings. These are rarely seen views, and they may be the last time the inner workings of a turbine are visible before the demolishing crews start work in the years to come.

## **A \$1.6 Billion Toy to Play With (Ken Thornton)**

It's a brisk Monday morning, marking the start of a new week at Eraring. As I pull into the parking lot, I can't help but reflect on the passage of time. How many years has it been since I first embarked on this journey? The initial stint commenced in November 1979 – a staggering 45 years ago. That tenure persisted for a solid 28 years. A brief second chapter unfolded for six months in 2013, just before the transition to Origin. And here I am in late 2024, as part of a two-year contract. My task has been to advise on what should be done with documentation from over three decades (pre-2013).

I swipe my card at the Main Gate, contemplating the changing faces within these familiar walls. There must be individuals here now who weren't even born when I first stepped onto this site. In June 2023, 105 out of Eraring's 200 personnel were born after November 1979.

In November 1979, the station was in its infancy, with the Admin building's foundations and the towering #1 stack reaching a modest 10 meters. The boiler/turbine building stood as a skeletal steel structure, housing the colossal concrete turbine plinth, while the fabric filters had yet to be installed on the bare ground.

The station's temporary main office, nestled amidst the bush on the eastern side of Construction Road, was a repurposed house and a cluster of portable buildings. Though Construction staff from the Electricity Commission were already on-site, Generation (Production)

staff were relatively new. Alan Shields, the Assistant Power Station Superintendent, had barely six months under his belt. Jack Maher, the Power Station Superintendent, had been in the position for a mere two months. John Marshall (Efficiency Engineer) and Peter Smith (Electrical Engineer) preceded me by a mere fortnight. I am not sure when Mechanical Engineer Frank Walsh arrived.

My assignment, alongside six or seven Charge Engineers (Shift Managers) gradually arriving throughout 1980, was monumental – to research, write, and publish a complete set of Operator Manuals from scratch. Sixty-eight distinct chapters of technical text and drawings awaited creation. A formidable task, especially for anyone familiar with translating Japanese technical documents into English. Additionally, preparations for the inaugural Operator Training School, scheduled for mid-1981, were underway.

The first group of Operators trickled in late 1980, with Alan Fitzgerald leading the way in September. Early to mid-1981, about 20 individuals joined the initial school, including John Woodward, Bob Ogden, Volka Baumgart, and Tony Chambers. Fast forward to 2024, and Ann Theodore and I are the sole survivors from those early days, both having left and returned.

Reflecting on that initial Operator school, memories flood back. It was held in what now constitutes the western portion of the main Admin Building. The Operators were predominantly from Vales Point and Munmorah, and at 16 weeks, the school seemed interminable. Notably, assessment papers bore no names, only student numbers – a practice inherited from Vales Point. Operators were keen on avoiding assessment marks influencing shift allocations.

For those present during construction, nostalgia undoubtedly colours memories of those days. Being part of a project that constructed Australia's largest power station was invigorating, especially one marked by numerous Australian if not world, firsts. Exploring the inner workings of equipment rarely opened for a decade or more, walking through the tunnel destined to carry cooling water to Myuna Bay, witnessing the caissons floated and sunk in Dora Creek, declining a ride to the top of #1 stack, and unravelling the complexities of the Siemens CLC (forerunner to DCS) were all cherished experiences. Attending Toshiba or IHI Christmas parties became a tradition, though the Lake's prawn population might have dwindled as a consequence. However, the memory of a tragic day in 1983, when two colleagues from the Chemical section lost their lives on the Ash Dam, casts a sombre shadow.

By the mid-1980s, after years of unbroken Operator Station schools, I could navigate the location of every fuse, switch, power supply, valve, motor, pump, and damper an Operator needed to know. Yet, in the early 2000s, reviewing a 'live' Permit to Work for an Ash and Dust Makeup Pump proved challenging. It took me 15 minutes to locate the elusive pump, eventually resorting to asking an Operator, someone I had trained years before. It underscores the old adage – 'use it or lose it.'

The early 80s were a whirlwind of activity and excitement. Working alongside colleagues from previous stations and those new to Eraring, it was a time of camaraderie and mutual support. As someone who still carries the Operator spirit, those were the golden days of 'playing' with the \$1.6 billion 'toy' the Electricity Commission was constructing for us.



*Figure 103 Coal conveyor floor with Tripper in the foreground, 2025  
(Ken Thornton)*

## **Training and Skill Development:**

### ***Operator Training***

#### ***Electricity Commission***

In 1981, operating staff for Eraring were recruited from other Commission sites. Many established operators transitioned to Eraring from stations such as Wallerawang, Munmorah, Liddell, Wangi, and Vales Point.

A few years later, the operator intake was extended to non-operator Commission staff. As part of the selection process, this second group had to complete an Operator Aptitude Course. Those who passed this course then proceeded to the Operator General Series training course, which lasted eight weeks.

This program was carried out at Pyrmont Power Station in Sydney. Participants were required to achieve a weekly pass mark of 75% and avoid failing two consecutive weekly exams. The stakes were high, and many prospective operators left their well-paying jobs to undertake the course. Failure could result in lower-paying employment or even dismissal.

The curriculum of this course covered various essential topics, including personnel and plant safety requirements, basic power plant layout, function and usage, principles of power plant operation, mechanical theory, thermodynamic theory, and electrical theory.

Upon completing the General Series, student operators moved on to the relevant power station, where they were required to attend and pass the station operator training course. This 14-week course covered topics similar to those of the General Series but with a station focus.

After completing the station course, trainees were assigned to a specific shift and worked on a three-shift roster for eight weeks. At the end of this period, the trainee would assume full shift duty as a member of the operating staff.

Throughout their tenure as operators, individuals were expected to attend regular refresher training sessions, primarily focused on safety and operational matters, to ensure their knowledge and skills remained current.

Initially, prospective Coal Plant Operators were not required to complete the General Series. However, Ash and Dust Operators were obligated to do so.

### ***Eraring***

For many years, the operator station schools at Eraring followed a well-established format comprising classroom lectures, plant inspections, examinations, and on-shift training. After completing the on-shift training component, prospective APPOs had to pass an oral test conducted by a Charge Engineer or Shift Manager, possibly with the assistance of a senior PPO.

During the mid-1980s, the Ash and Dust and Coal Plant Schools were self-paced and, at one point, ran simultaneously with an APPO Station School. This arrangement was made possible through the cooperation of trainees who came from other ECNSW stations. The Charge Engineers conducted the PPO Station Schools.

Throughout 1980, the number of operating staff gradually increased. This included the initial group of Charge Engineers: Ron Hollis, Rod King, Jack Kennedy, John Zerbes, Norm Whipp, Mal Ireland, and Alan Vitnell. The main focus for the Charge Engineers and myself during 1980 was to prepare for the first operator training schools scheduled for early 1981. We conducted daily plant inspections to observe equipment installation and familiarise ourselves with the various components. Looking back, I consider this period one of the most fascinating times in my career. Everything was new, with some equipment being introduced for the first time by the Commission and some being the first of its kind in Australia. Notable highlights from those early days include

witnessing the floating and sinking of the 360-meter-long Dora Creek caisson and learning about the intricacies of the Siemens PLC control system. Another memorable experience was standing at ground level and looking up at the towering 200-meter-high #1 chimney stack.

As the start date for the first operator training school approached, the Charge Engineers were sent to the USA to study the operation of large Pulverising Fuel Ball Mills.

If I recall correctly, the first Operator Station training school lasted ten to twelve weeks. Since the main part of the Administration Building had not yet been completed, the school took place in the Electrical Services Building.



*Figure 104 Early Operator Training School, August 1981*  
*L to R: Rod Mahood, Neil Jackson, Alan Oakley, Peter Casey and Instructor Ken Thornton. (ECNSW 13427)*



## CHAPTER 10 REGULATORY AND ENVIRONMENTAL

### *Safety at Eraring: A Journey of Transformation*

#### *Electricity Commission, Pacific Power, and Eraring Energy<sup>84</sup>*

In the early years, oversight of site safety was under the jurisdiction of a corporate Occupational Health and Safety (OHS) Group in Sydney. However, by the late 1980s, it became clear that a shift was needed to improve on-site safety. The pivotal decision was to introduce dedicated Safety Officers to all Electricity Commission power stations, marking a significant transformation in safety management.

Recruiting these new roles was meticulous, with individuals carefully selected for each site. After a rigorous 12-week training program, site Safety Officers began their crucial duties. Initially guided by the corporate OHS Group, they later reported directly to the on-site Commercial Manager, which eventually led to the dissolution of the corporate OHS Group.

During this transformative period, two influential figures emerged as advocates for consolidating safety resources at the station and integrating safety into site management. Brian Byles, the Power Station Manager, and Norm Brooks, the Commercial Manager, played pivotal roles in establishing Occupational Health and Safety (OHS) as an integral part of power station activities. They championed the implementation of the National Safety Council's NSCA Five Star Program and actively supported the development of an innovative on-site Occupational Health and Safety (OHS) Management System.

Over time, Eraring demonstrated progress, starting with a single star in its inaugural year of the Five Star Program. The station's safety performance steadily improved, culminating in an impressive five-star rating for the last seven years of its program involvement.

Fast forward to the formation of Eraring Energy, a monumental event ushering in a new era of safety enhancement across diverse locations in New South Wales. Gerry Grove-White, the Managing Director, and Peter Jackson, the General Manager of Production, prioritised safety, making it a cornerstone of the organisation's ethos.

Eraring Energy appointed an OHS Manager, field safety officer, and dedicated safety officer to drive this transformative endeavour. Their primary objective was to develop a comprehensive OHS Management System tailored to the organisation's unique needs. Eraring Energy fostered a culture of inclusivity by actively involving employees and contractors in various safety initiatives.

Key initiatives included a Safety Day in 2001 with ANU sociologist Andrew Hopkins as the keynote speaker. These platforms recognised individuals' contributions to safety improvement and engaged them in shaping the safety agenda. BSafe, a program encouraging voluntary safety observations, became a catalyst for cultivating a proactive safety culture.

Eraring Energy continued the committees and expanded them to provide additional avenues for employee contributions to safety improvement. These committees covered areas such as Plant Safety Improvement, Health Improvement, Auditing and Benchmarking, Electrical Safety, Access to Apparatus Rules, and Confined Space.

In 2008, the organisation's commitment to safety leadership was recognized with State and National Public Sector Leadership in Injury Prevention and Management Awards. Eraring employee Paul Waters received the State Award for Individual Contribution to Safety, solidifying the organisation's commitment to safety excellence.

Eraring Energy continued to pursue safety leadership, continually striving to enhance its safety performance. As the Managing Director, Peter Jackson ensured that OHS retained its prominence as a core organisational value. Additional resources were allocated to the OHS Group, and active collaboration between managers and team leaders, along with employees, aimed to create the safest workplaces in the Australian electricity generation sector.

Further reinforcing the commitment to safety, a dedicated subgroup of safety personnel was appointed to oversee upgrade outages. Resources were increased in various OHS areas, including reporting, system management, BSafe support, and Worker's Compensation injury management. Senior managers engaged in benchmarking exercises and visited external organisations to gain insights into effective OHS management practices.

Regular audits ensured compliance with OHS Management Systems and WorkCover's Self-Insurer's OHS Management System requirements. Additionally, an external consultant thoroughly reviewed the organisation's OHS Management approach, enhancing the existing Management System.

These unwavering efforts bore fruit, achieving a year without any lost-time injuries in 2013, a stark contrast to the Lost Time Injury Frequency Rate of 80 recorded in 1990. The success was a testament to individuals at all levels who contributed to this achievement through unwavering dedication to safety.

As Eraring Energy continued its journey, it remained committed to upholding safety leadership and further elevating its safety performance. With a strengthened OHS Group, active engagement of managers and employees, and a culture of continuous improvement, Eraring Energy aimed to set an example in safety within the Australian electricity generation sector.

### ***Origin Continues the Safety Legacy***

Since 2013, Origin has continued to build on the foundations of safety set by Eraring Energy, implementing initiatives and programs to enhance health, safety, and environmental (HSE) performance.

Ashlee Virgo, Eraring's Principal Health & Safety Business Partner at the time, suggested that "the world of safety at work has evolved significantly" since Eraring was commissioned. New challenges and opportunities arise from changes in the energy sector, regulations, and social expectations. Under previous NSW Occupational Health and Safety Acts, the onus was on the employer. For example, "An employer must ensure the health, safety and welfare at work of all the employees of the employer."<sup>85</sup> "An employee must, while at work, take reasonable care for the health and safety of people who are at the employee's place of work and who may be affected by the employee's acts or omissions at work."<sup>86</sup> With the 2011 Work Health and Safety Act, the duties of employees subtly changed such that each employee must "take reasonable care for his or her own health and safety."<sup>87</sup>

Origin has responded to these changes by adopting a holistic and proactive approach to safety, encompassing personal safety, process safety, and critical control reviews. Personal safety remains paramount, with Origin focusing on preventing injuries and incidents by identifying and managing hazards, ensuring compliance with standards and procedures, and fostering a positive safety culture.

Process safety is vital as Origin aims to prevent major accidents and losses by managing the integrity and reliability of its assets, systems, and processes. Julie Barnett, Origin's Principal Advisor for HSE Strategy, Programs & Governance, notes that "process safety is all about 'keeping it in the pipe'. When we manage occupational safety, we put barriers in place to make sure no one

gets hurt. With process safety, we put barriers in place to keep hazardous materials and energy contained within the process.”<sup>88</sup>

Critical control reviews assess the effectiveness of controls that prevent or mitigate the most serious risks.

Origin also prioritises the health and well-being of its people, recognising the importance of physical and mental health. Initiatives such as Peer Connect and Mates in Energy provide support for employees facing personal or work-related issues. Health assessments, vaccinations, fitness programs, and other health services are also offered.

Compliance with relevant legislation and regulations, such as the Work Health and Safety Act 2011 and the Work Health and Safety Regulation 2017, is a commitment Origin upholds. Workplace Health and Environment (WHE) teams ensure compliance, maintain licenses and certifications, and build the health and safety capability of employees through training, coaching, and mentoring.

Outages, periods of maintenance or upgrades pose significant safety challenges. Origin has established a robust outage safety structure, collaborating with contractors and regulators to ensure safe and efficient operations.

Origin celebrates achievements in health, safety, and environment through annual HSE awards, showcasing best practices and improvements. These initiatives have resulted in tangible and intangible benefits, including reduced injuries, improved asset integrity, enhanced employee engagement, and increased stakeholder confidence.

Safety remains a core value and strategic priority for Origin, continuing the legacy of safety excellence initiated by its predecessors. Origin's commitment to safety endures, adapting to the evolving landscape of the energy sector and demonstrating its dedication to the well-being of its workforce and the broader community.

### ***Power Station and High Voltage Safety Rules, Access to Apparatus Rules, Generation Safe Access Procedures***

For over forty years, the Electricity Commission and then Pacific Power had a methodology that outlined how plant and equipment would be made safe for work. Their titles indicate the circumstances in which each set of Rules was to be applied. For most, if not all of those years, the content of each set of Rules was a corporate responsibility and was to be applied across the organisation. From 1996, with the disaggregation, each Production Business Unit and TransGrid progressively took responsibility for managing the Rules on their sites. With this change, each group had their own Safety Rules Committee and editor. At Eraring, that role was filled by Charge Engineers, with Bob Sylvester holding the position for many years.

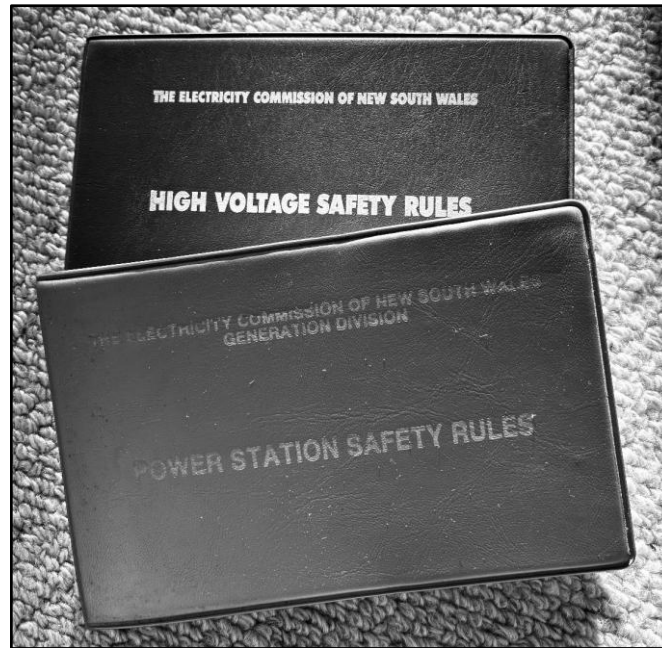


*Figure 105 Electricity Commission Safety Rules*

In the latter years of the 20th century and the early years of the 21st century, at least from a Safety Rules perspective, three periods stand out: the first following the disaggregation in 1996, the early years of Eraring Energy, and those of Origin Energy.

At the time of disaggregation, Eraring staff developed the first electronic Permit-to-Work system. Called the Safety Rules Information System (SRIS), it went live in about 1996. This software platform was considered not Y2K compliant. In late 1998, a second ePTW system, the Work Permit System (WPS), was developed and went live in late 1999.

In the early 2000s, Eraring Energy's Managing Director Gerry Grove-White challenged the organisation to prove the claim by Eraring staff that the Safety Rules were the best in Australia, if not the world and, by inference, fit for purpose. In 2005, 23 staff members participated in a significant off-site program that benchmarked the world's best practices in industrial plant isolation.<sup>89</sup> Teams of two or three people travelled to all Australian states, the United Kingdom, and Hong Kong to investigate how large industrial facilities made apparatus safe to work on. These investigations indicated that Eraring's procedures needed updating. The most significant change was the first step in extending the long-established Tagout system to include an extensive physical Lockout component. The system utilizes lockable points of isolation and key safes. Tracking key movements from key safe to permit and between key safes is fundamental to the system's functioning. The NiSoft computer program provided this functionality and went live in 2008.

In parallel with the benchmarking project, the Safety Rules were rewritten using 'plain English' principles to improve their readability and usability. Initiated by Eraring's Training Manager, this project was led by Glen Ramsey and Jim Davies.

Eraring Energy's Access to Apparatus Rules (ATAR), an updated and combined version of the Power Station Safety Rules (PSSR) and High Voltage Safety Rules (HVSr), were introduced in October 2003.<sup>90</sup> As per their predecessors, they governed access for work on or near apparatus controlled from a control room and sundry apparatus using a safe system of access. They consisted of four (4) safe systems of access. Only the first one was a permit-based process. The processes were:

- Submitting a Request for Access to receive a permit for work on high voltage equipment, defect or routine repairs involving mechanical, electrical, or civil skills, or work in a confined space.
- Conducting (Specified) work or testing on operator-controlled apparatus for which a permit is not required, such as changing a filter, clearing a coal feeder blockage, or adjusting control transmitters.
- Working on non-operator controlled equipment (Sundry) for which a permit is not required, for example, repairs to MP & L circuits.
- Checks and work on operator-controlled apparatus with an approved procedure where isolation is not required and has prior approval from an Operator. For example, greasing, condition monitoring, and oil sampling.

**“Nothing is so  
important that it  
cannot be done  
safely.”**

Gerry Grove -White 2002

### *Origin*

As with many once locally managed processes at Eraring, the processes governing safe access to plant and equipment have been centralised into a corporate function. As in the Electricity Commission years and the early days of Pacific Power, the premise was to standardise similar processes across all generating sites.

The ATARs were superseded in 2019 by Origin's Generation Safe Access Procedures, emphasising a risk-based approach to work safety.<sup>91</sup> The formal introduction to the 2023 version of the procedures notes that they are processes used to control work identified as potentially hazardous and provide for the safe and efficient execution of operational and maintenance activities. The processes also reinforce communication between maintenance planning, managers, supervisors and those who carry out high-risk activities.

As noted above, Eraring's first digitised PTW systems, SRIS and WPS, were introduced in the mid to late 1990s. The NiSoft program was introduced in 2008 to facilitate the management of the Lock Out Tag Out System. By 2020, and after several upgrades, the NiSoft ePTW (electronic Permit to Work) system was being utilised across Origin's generating sites.

The NiSoft system is a digital solution designed to streamline the issuing, tracking, and management of work permits within industrial and engineering environments.<sup>92</sup> This system replaces traditional paper-based permit systems, offering a more efficient, secure, and traceable method of ensuring that work is carried out safely and in compliance with regulatory and company-specific safety standards.

Key features of the NiSoft ePTW system include:

1. **Digital Documentation:** It digitises the entire permit-to-work process, allowing for electronic submission, approval, and archiving of permits. This ensures that all relevant documentation is readily accessible and can be reviewed or audited whenever necessary.
2. **Workflow Management:** The system provides a clear and structured workflow for permit creation, review, approval, and closure. It can enforce checks and balances by requiring necessary approvals at various stages, ensuring that all safety protocols are followed.
3. **Integrated Safety Systems:** NiSoft ePTW can integrate with other safety and operational systems to ensure comprehensive risk management. This includes compatibility with isolation management systems, risk assessment tools, and other safety-related documentation.
4. **Real-time Monitoring:** It offers real-time visibility into the status of work permits and activities across the facility. This enables management and safety officers to monitor ongoing work, ensuring that operations comply with safety regulations and procedures.
5. **Access Control:** The system controls who can create, approve, and manage permits, ensuring that only authorised personnel are involved in the permit-to-work process. This helps to maintain a high standard of safety and compliance.
6. **Reporting and Analytics:** NiSoft ePTW provides detailed reporting and analytics capabilities, allowing organisations to analyse trends, identify areas for improvement, and make informed decisions regarding workplace safety and efficiency.
7. **Compliance and Safety Enhancement:** By standardising the permit-to-work process and ensuring adherence to safety protocols, the system helps to reduce the risk of accidents and incidents, thereby enhancing overall safety.

## *Incidents*

Discussion of serious and not-so-serious incidents could fill a second volume of this history. The following are short discussions on a few of these.

### *Toe Drain Tragedy – The Death of Two Chemists*

While several people sadly lost their lives at Eraring during construction and later, the deaths of chemists Paul Bayl and Stewart Gibbins on November 2, 1983, were particularly tragic for their families, friends, and work colleagues. 40 years on, in November 2023, this sad event was remembered with the visit by the daughter of one of the fellows. Flags were flown at half-mast to commemorate the tragedy.

Paul had been with the Commission for eighteen years and Stewart for five. Their deaths highlighted the need to be aware of the hazards associated with confined spaces.

Operations Assistant Phil Turner remembers this tragedy as "one I will never forget."<sup>93</sup> Phil recounts that on the day, chemist Gorden Deans rushed into his office saying that Paul and Stewart had fallen into a toe drain pit out onto the ash dam. "I immediately rang the Charge Engineer." Charge Engineer Norm Whipp remembers the day slightly differently, but only that he was in a meeting with Assistant Power Station Superintendent Alan Shields when Phil burst into the room to inform them of the incident.<sup>94</sup>

### *Diver Dies After Entering the CW Inlet Canal*

An operator's job is important and sometimes stressful, but few instances could be considered traumatic. One such occasion was the incident on Unit 4 in January 1988 when a diver drowned trying to clean the trash bars on the unit's High-Level canal inlet.

On this particular day, the task was for a diver to clean the High-Level canal trash bars. The flow of water through the trash bars for a unit at full load (both main condensers passes in service) would have been too strong to allow the diver to enter the water. The flow would be further increased due to the high differential across the weed-enveloped trash bars.

One main condenser pass was to be taken out of service to reduce the flow. This would have required a reduction in load, but it would have reduced the water flow through the trash bars sufficiently to allow the diver to enter the water.

This procedure was successfully followed for Units 1 and 2 the previous week and Unit 3 earlier in the day. Unit 4 PPO was waiting to be notified that the diving team was ready to work on his unit. He then, as instructed by the Daily Operating Instruction (DOI), would have taken one main condenser pass out of service, thus reducing the flow. It is unclear why Unit 4 PPO was not informed that the diving team was about to work on his unit or why the diver entered the canal. The high water flow pushed him against the trash bars, where he became trapped and eventually drowned.

### *Eraring Power Station Boiler Explosion*

This is an edited version of a Newcastle Herald report on a boiler explosion that occurred on September 8, 2012.<sup>95</sup>

On a Saturday night at Eraring Power Station, an incident prompted the response of four fire brigades following a report of an explosion by a local resident. The event resulted in a two-meter by one-meter hole in one of the recently upgraded boilers. Jeff Hogan, the executive manager of Eraring operations, described the incident as "very serious," highlighting the fortunate outcome

that no injuries occurred, though the damage would require months for repairs. He told the Lakes Mail that boiler experts had been brought in to investigate.

"Initial investigations indicate that there was a fracture of a steam pipe which vented steam at high pressure and in substantial volumes into the chamber housing the pipes," he said. "This chamber is not designed for any kind of pressure loading, and the volume of pressurised steam filled it in seconds to the point where a corner wall of the structure was ruptured, leaving a rent about two meters long and about a meter wide."

Mr Hogan said although the cause was yet to be determined, sections of four of the pipes that feed the boiler's furnace had also been dislodged by the incident.

The affected boiler and generator were part of a three-year, \$750 million upgrade to the power station and had recently undergone commissioning tests. The boiler was operating at full capacity when the failure occurred. This led to the implementation of strict access restrictions to all units as a safety measure. Despite the setback, the power station's supply capacity was not expected to be impacted in the short term, with a forecast indicating sufficient supply from the remaining operational units to meet demand until repairs could be completed.

### *Ash Dam and Myuna Bay Sport and Recreation Centre*

In 2019, the NSW Government closed the Myuna Bay Sport and Recreation Centre.<sup>96</sup> This followed an independent review that found the centre to be unsafe due to the serious potential risk to clients and staff arising from the potential failure of Eraring Power Station's ash dam wall in the event of major seismic activity.

In July 2020, the NSW Government announced a preferred site for a new Sport and Recreation Centre. The site was approximately one-kilometre southeast of the former Myuna Bay Sport and Recreation Centre and proposed to have access to Lake Eraring.

Following community feedback and a proposal from the Member for Lake Macquarie, the NSW Government agreed to consider an alternative site for the new Lake Macquarie Sport and Recreation Centre. The alternative site is at Morisset on land that was previously part of the Morisset Hospital within the Lake Macquarie Conservation Area. After receiving the proposal from the Member for Lake Macquarie, the NSW Government investigated the viability of the alternate site. The results of this work found that the site could accommodate a sports facility, and on January 27, 2022, the NSW Government announced that it would construct the new Lake Macquarie Sports Centre at the site.<sup>97</sup>

### *Origin Statement on Myuna Bay Recreation Centre – 29 March 2019<sup>98</sup>*

*As part of our ongoing maintenance and monitoring of the Eraring ash dam late last year, Origin commissioned an engineering review of the facility.<sup>99</sup> This review found that while the dam is stable, it could be affected in the event of a major earthquake. As a result, Origin recently contacted the NSW Office of Sport to discuss the findings of the review, given the proximity of the Myuna Bay Recreation Centre, which sits downhill from the ash dam. On our advice, the Office of Sport has agreed to close the Centre to ensure the safety of clients and staff.*

*Origin Executive General Manager, Energy Supply & Operations, Greg Jarvis, said: "While we understand that the likelihood of a serious seismic event is low and that a breach of the dam wall is therefore very unlikely, we are taking the only responsible measure by acting on the basis of a worst-case scenario. Origin will always act extremely cautiously in any health or safety matter and in the community's best interest."*

*Origin is also implementing a range of measures to improve the structure of the Eraring ash dam so that it aligns with a worst-case scenario earthquake.*

*The Eraring ash dam was assessed for its ability to withstand a major earthquake, which is a requirement of the guidelines developed by the Dam Safety Committee under the Dam Safety Act 2021. While the likelihood of an earthquake of this scale is low, the consequence would be significant.*

*"We understand the significance of the Centre to the local community and acknowledge the inconvenience that this closure causes. We would like to thank the NSW Office of Sport for acting expediently on our advice. We have already completed engineering studies on improvements to the ash dam wall, and we will do everything we can to finalize this as quickly as possible," Mr Jarvis said. Origin Energy has offered to compensate the government, and this is the subject of continuing negotiations. These actions do not affect the safe continuing operations of the Eraring Power Station, which is a critical part of the national electricity market, accounting for around 20 per cent of the power needs of NSW.*

### ***Environmental Stewardship and Sustainability:***

#### ***Unveiling Real Solutions to Environmental Challenges***

From the early design days in the mid-to-late 1970s to the 21st century, Eraring's people have grappled with evolving environmental realities. For example, the temperature of the water returned to Myuna Bay is managed by the overflow from the High-Level Canal. The 2010 addition of an 800-megalitre attenuating reservoir was a response to the increase in station output from 2,640 MW to 2,888 MW.

Fabric filters are positioned after the Induced Draft (ID) fan in the flue gas system. This ensures the effective removal of particulate matter from the flue gas before it is released into the atmosphere, contributing to environmental compliance and air quality standards.

While not part of the station's original design, silencers were added after the Induced Draft (ID) fans were installed early in the station's life. When the station was commissioned, noise complaints were received from concerned residents in Dora Creek.<sup>100</sup> Following an investigation, the intermittent noise problem was found to be caused by a temperature inversion, which refracted the noise of the Induced Draft fans to the nearby town. After extensive laboratory testing, reactive-dissipative silencers were installed in the ducting downstream of the fans, which overcame the noise problems.

**Water Conservation and Recycling:** The station's original design called for water for boiler, fire services, and domestic use to be sourced from Hunter Water. From the 1990s, onsite treatment of secondary treated effluent from Hunter Water's Dora Creek wastewater treatment facility reduced the station's potable water consumption.

**Internal and External Awareness Initiatives:** Ongoing internal environmental awareness programs help employees understand their environmental obligations.

**Aquatic Impact Monitoring:** Near Lake Macquarie, EPS takes a real-world approach, adopting a "best practice" scientific method to monitor cooling water impact and study genuine implications on seagrasses and aquatic organisms.

**Emission Reduction Measures:** One outcome of the station output upgrade has been a cut in CO<sub>2</sub> emissions by 200,000 tons per annum and NO<sub>x</sub> emissions by 40%.

**Awards and Collaborations:** Awards acknowledge Eraring's continual improvement under an ISO 14001-accredited environmental management system. Collaborating with the NSW Aboriginal Land Council yields genuine outcomes like a sustainable seed propagation enterprise.

**Community Engagement and Collaboration:** Engagement with stakeholders through Community Forums and Environmental Strategy meetings isn't just for show. Working parties genuinely address issues affecting communities, embodying real collaboration.

From the early design days of the 1970s to today, Eraring's commitment to its environmental responsibilities is grounded in genuine efforts, navigating the balance between power generation and genuine environmental stewardship.



*Figure 106 The Attemperating Pond is filled from the High-Level Canal and discharges into it when the outfall canal water needs to be cooled.  
(Eraring Energy)*



*Figure 107 Across the Attemperating Pond (Origin Energy)*

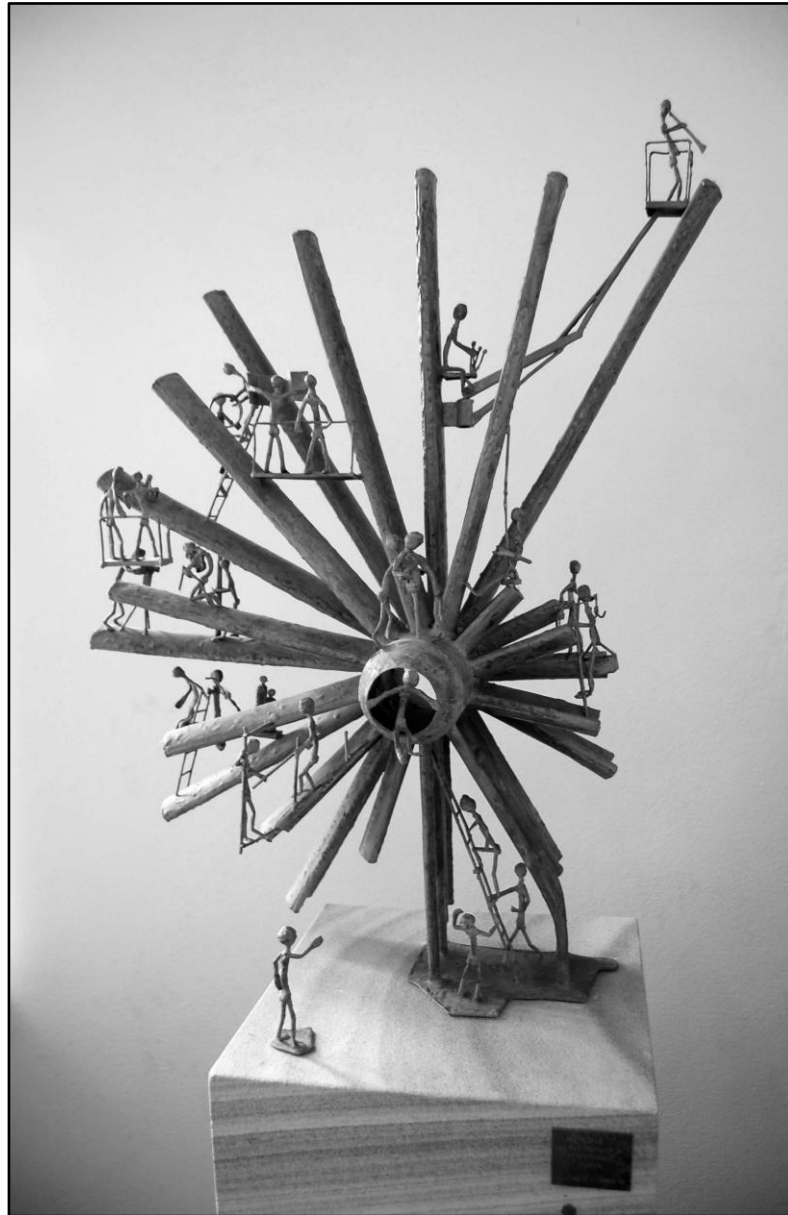


*Figure 108 (Peter Trimmer)*



*Figure 109 Presentation to Westpac Rescue Helicopter Service, December 2024.  
Graeme Rowe, Westpac's Regional Partnership Officer and Anthony Ham, Group Manager Generation  
Asset Operations (Origin Energy)*

## CHAPTER 11 COMMUNITY ENGAGEMENT AND SOCIAL IMPACT

### *Community Impact*

Power stations can have a significant impact on local communities, both positive and negative. They can provide job opportunities and contribute to local economies, but they can also lead to environmental concerns, noise pollution, and health issues for residents in the surrounding area.

### *Public Perception*

The perception of a power station can affect its acceptance and support from the public. If the station is seen as clean and environmentally friendly, it may receive more favourable public opinion compared to stations with a negative reputation.

### *Corporate Social Responsibility*

How a power station engages with its community, supports local initiatives, and demonstrates a commitment to social and environmental responsibility can shape its intangible reputation.

### *Education and Awareness*

Power stations can contribute to public education and awareness about energy generation, consumption, and environmental effects. Educational initiatives can enhance the station's intangible value.

### *Collaboration and Partnerships*

The station's collaborations with other industries, research institutions, and organisations for technological advancement and sustainability efforts can contribute to its overall intangible reputation.

### *The Social Fabric and Community Relations*

Eraring is an interesting case study of the intricate interplay between technological progress, community dynamics, and social change. From its pre-commissioning days in the late 1970s, the station has left an indelible imprint on the immediate and local communities, shaping their social fabric, economic landscape, and environmental consciousness.

Nearby, Wangi Power Station (1956–1986) and later Eraring affected their respective communities both economically and socially. Visually, Wangi, more so than Eraring, still dominates the local skyline forty years after decommissioning.



*Figure 110 Wangi Power Station, 2023*  
(Ken Thornton)

Nevertheless, Eraring's emergence marked a significant shift in its local area and the wider community's identity. As a large industrial facility, it became a defining feature of the landscape, altering the community's physical and symbolic environment. Eraring created a sense of place and belonging among its employees, their families, and the broader community. A shared identity emerged as individuals identified with the station's role as an economic engine and a source of community pride. Each station's operations forged a unique bond among workers, fostering camaraderie and a distinct sense of purpose that transcended traditional social boundaries.

Few of Eraring's workforce live in the immediate area of Eraring and Dora Creek. Toronto, Morisset, Morisset Peninsula, and Cooranbong are the closest. Newcastle, Lake Macquarie, and particularly the Central Coast have a significant proportion of Eraring's workforce. Overall, it would be fair to say that Eraring's establishment contributed to transforming the area's labour landscape, which started with Wangi, Vales Point, and Munmorah. The influx of job opportunities offered by these stations attracted a diverse workforce, reshaping the community's demographics. Across the latter half of the 20th century, the work culture at these stations, characterised by technical expertise and specialised skills, elevated the status of their employees and created a sense of professional pride. Employees became not only breadwinners but also symbols of expertise, innovation, and professionalism, further enhancing each station's role as a source of community identity.

In the 1970s and 1980s, Liddell was the first station to employ increasing numbers of females. Over the years, Eraring has remained a traditionally male-dominated workforce. In August 1981, the female workforce composition was 8%, and by 2023, it had only increased to 11%. What has changed, however, are the community's gender norms and expectations. Women entering engineering and technical roles at Liddell and later stations challenged preconceived notions about suitable career paths, paving the way for broader discussions about gender equality in the workplace and beyond.

Eraring's impact on the local community transcended its physical boundaries, sparking a robust discourse on environmental responsibility and community activism. As concerns about air and water pollution, flora and fauna, and greenhouse gas emissions grew, community members became engaged in discussions about the station's ecological footprint. Environmental organisations,

concerned citizens, and local activists emerged as key stakeholders, advocating for cleaner and more sustainable energy alternatives. The power station's presence catalysed a heightened environmental consciousness, prompting a collective reevaluation of the delicate balance between technological advancement and environmental preservation.

The power station's efforts to engage with the community fostered a sense of social integration and collaboration. Open days, community forums, and educational initiatives provided platforms for dialogue and interaction between station personnel and local residents. The Eraring Community Forum, established in 2003 and updated in February 2023, addresses issues of community importance. The earlier forum discussed marine life and its protection, plant upgrades, and the heritage matters of First Nations people. The latter group discussed Eraring's transition, community investment, and employee support in its early meetings. The Eraring Community Investment Fund was established in 2023 to support the community during Eraring's transition.<sup>101</sup> The fund will invest \$5 million between 2023 and 2032 to support groups or initiatives that contribute to community well-being, community resilience, economic growth, and diversification or improve environmental protection and outdoor amenity within the Lake Macquarie Local Government Area.

The fund will support activities that benefit communities directly affected by Eraring's closure and aims to prioritise sustainable projects that deliver an enduring community benefit.

Through the Origin Foundation Employee Volunteering Program, Eraring employees have donated their time to community programs they are passionate about. In 2020, employees worked with community partner SolarBuddy to assemble 50 individual solar lights within 24 hours for those who had lost power because of the bushfires.

Since 2013, Origin has contributed over \$600,000 to local groups to support community programs that help deliver favourable community safety, health, and well-being outcomes and improve skills and education opportunities.<sup>102</sup> For example, Origin supported Sunshine-Silverwater Landcare, which concentrates its efforts on the 28 hectares of foreshore reserve from Johnny's Point in the north to Sunshine Park and adjoining bushland in the south. They also assisted Southlake Youth Service's food package deliveries, which saw a sharp increase in demand due to COVID-19. Strict hygiene protocols were implemented to ensure employees could deliver meals as part of our long-running volunteer program with Meals on Wheels.

Origin has, through Wangi Lions Club, supported the Dobell Festival, Carols on Dobell, and the refurbishment of Dobell House over the years.

These initiatives demystified the station's operations and facilitated cross-cultural exchanges and mutual understanding. The power station's involvement in local projects, cultural events, and infrastructure improvements further solidified its role as a responsible and participatory community member.

Over the station's 40+ years, there have been many instances of involvement with the local community. Sponsorship of community events and employee involvement are the most common forms of engagement. Eraring staff, through active participation in fundraising activities and generous payroll deductions, continue to support many worthwhile charities and organisations, such as Camp Quality, CanTeen, the Bill Walsh Cancer Research Fund, the John Hunter Children's Hospital, and the Westpac Rescue Helicopter Service.

Partnering with Toronto High School had been a regular activity for many years. In Electricity Commission days, the author recalls presenting to Year 11 students on how power stations work. In recent years, programs have helped increase student access to technology, engineering, and

math (STEM) subjects.<sup>103</sup> Eraring employees have volunteered many hours to mentor and assist students in their STEM learning. Over 200 students have participated in the program.

In the face of evolving global energy trends and heightened environmental awareness, Eraring and its community in 2023 are at a pivotal juncture in conjunction with the increasingly uneconomic viability of coal-fired generation. The imperative to transition from coal to cleaner energy sources poses challenges and opportunities. The community's ability to adapt to this transition will determine its ability to retain the positive aspects of its historical association with the power station while embracing the imperative of sustainability.

Eraring is a testament to the intricate interweaving of technological progress, social dynamics, and community evolution. Its impact on the local community extends beyond economic contributions to shape the social fabric, influence gender norms, inspire environmental discourse, and foster a shared sense of identity. As the community navigates the complexities of transition and adaptation, it does so with a legacy defined by the complex tapestry of connections, changes, and transformations woven by Eraring's presence.

### ***Eraring and the Energy Transition***

Eraring is not the first and will not be the last to close. Eraring will be the fifth major NSW power station to cease production over the previous three decades. Vales Point A was decommissioned in 1989 in its 28th year. The others are Munmorah in 2010 and Wallerawang C in late 2014, neither of which reached its 50th year. Liddell closed in its 52nd year in 2023 due to age and environmental factors. The other stations were victims of high operating and maintenance costs, as well as a significantly falling demand for electricity.

#### ***Vales Point A***

Vales Point A was equipped with three 200 MW English Electric turbo-alternators (Units 1 to 3) and one 275 MW unit from Associated Electrical Industries (Unit 4).<sup>104</sup> The first two units were completed in 1963, and the third in 1964. Unit 4 was commissioned in 1966. These four units, known as 'A' Station, had a capacity of 875 MW, the highest in New South Wales at the time. Vales Point 'A' was decommissioned in 1989. The turbines were removed in 1997, and the boilers and buildings were demolished between 2011 and 2014.

#### ***Munmorah***

Munmorah was clearly a high-cost generator.<sup>105</sup> This effectively prescribed the demise of Units 1 and 2. Bidding Units 3 and 4 into ELEX was difficult enough, let alone having another 600 MW available to actively maintain and be ready for 'as required' generation. Therefore, the continued dry-storage of Units 1 and 2 was a de facto consequence of this series of events. Mt. Piper Units 1 and 2 came online in 1992 and 1993, diminishing the need for Munmorah Units 1 and 2.

In the years leading up to Munmorah's final production run in August 2010, the demand for electricity in New South Wales continued to decrease. Generation from all NSW generators, public and private, fell by 11% between 2008-09 and 2012-13. Munmorah's contribution declined from 3.37% in 2008-09 to zero three years later. As had been evident two decades earlier with the decommissioning of Units 1 & 2, newer and more efficient generators at Vales Point B, Eraring, Bayswater, and Mt Piper had overtaken Munmorah's place in the national electricity market.

### *Wallerawang C*

Wallerawang C was located near Wallerawang, in the Central Tablelands region of New South Wales. The power station was equipped with two 500 MW units supplied by CA Parsons and Company of Newcastle-upon-Tyne.

In July 2013, EnergyAustralia acquired Wallerawang and Mount Piper Power Stations from Delta Electricity for \$160 million.<sup>106</sup> Due to dwindling demand, the first of Wallerawang's two generating units was mothballed in January 2013 and the second in April 2014. In November 2014, EnergyAustralia announced it would permanently close Wallerawang due to ongoing reduced energy demand, lack of access to competitively priced coal, and the power station's high operating costs.

### *Liddell*

Liddell was located near Muswellbrook, New South Wales. It was commissioned between 1971 and 1973 and had four 500 MW steam-driven turbine alternators, providing a combined electrical capacity of 2,000 MW. The station used coal as its primary fuel and oil as its secondary fuel. The station was assessed to have an operating capacity of 1,680 MW in April 2018. The power station was decommissioned in April 2023, with the last unit taken out of service on April 28, 2023.

### *Other NSW Stations*

Apart from Eraring, at the start of 2024, three major coal-fired stations were operating in NSW: Vales Point B, Bayswater, and Mt Piper. These are expected to close in 2028-29, 2033, and 2040, respectively.

### *Selling Eraring*

#### *Eraring is Sold – The First Time, 1981*

In May 1980, to meet the projected six to seven per cent per annum growth in demand, some of the ECNSW's power station projects were brought forward or combined into an Accelerated Electricity Development Program (AEDP). This capital works program was estimated to cost

approximately eight billion dollars over ten years.<sup>107</sup> The AEDP comprised ten 660 MW generating units over three major projects: Eraring, Bayswater, and Mt Piper. The planned completion date for the last of these projects (Mt Piper) was estimated to be February 1988.<sup>108</sup>

To finance the AEDP, the Electricity Commission envisaged utilizing internal funds and the traditional source of financing—Federal Loan Council-approved borrowings. Yet, the latter was becoming increasingly difficult to acquire due to changes in Commonwealth Government policy. In response to these financing issues, the State Government engaged New York investment bankers Solomon Brothers to collaborate with the NSW Treasury and the Electricity Commission on developing alternative financing approaches. The subsequent proposal encompassed Eraring's sale to a private consortium of Australian banks and companies. The partners, including the Bank of New South Wales (Westpac), Elders IXL, and the Australian and New Zealand Banking Group, contributed \$203 million and borrowed the remaining \$1.6 billion from international lenders.<sup>109</sup> This financial undertaking, often referred to as a leveraged leasing arrangement, was, for tax purposes, a transfer of Eraring from public to private ownership.

The sale, however, was unusual in that the Electricity Commission had a majority of members on the Board of the new Eraring Power Company and consequently controlled all aspects of the station's management and operations.<sup>110</sup> As the Partnership's Management Agent, the Electricity Commission provided all operational and maintenance requirements, including fuel and labour. As the sole purchaser of the station's electrical output, the Commission was obliged to pay a price sufficient for the partners to earn an agreed after-tax return on their investment.<sup>111</sup>

For the Commonwealth Government, the complication of the "Eraring Deal," as the media began calling it, was the loss of \$250 million to \$300 million in taxation income.<sup>112</sup> The contentious aspect of this issue revolved around the banks and companies that made up the partnership being eligible for a Commonwealth investment allowance and a tax reduction on the depreciation of power station equipment. Additionally, the consortium was eligible for tax deductions on the interest payments associated with its overseas borrowings. Within a week of the Eraring arrangements being announced in December 1981, the Commonwealth Government disallowed any similar 'Eraring-style' financing arrangements.<sup>113</sup> In contrast, many in the media and the financial industry viewed the 'Eraring Deal' as unique and innovative.<sup>114</sup> The *Sydney Morning Herald* labelled it "the most sophisticated and innovative financial deal ever attempted by an Australian public utility."<sup>115</sup>

#### An Alternate view

Within a few years, it became apparent that NSW had heavily overinvested in power stations. John Asquith (2024) recalls Barry Flanagan giving a talk to management where he outlined how oversupplied the NSW Grid would be in the late 1980s. Queensland, under Joh Bjelke-Petersen, had just beaten the Operators (previously thought unbeatable) in an industrial dispute, and NSW wanted a similar outcome. As a result of overinvestment, Mt Piper was to be delayed or put into storage, but Bayswater was kept to program as the unit cost of production was very low. Eraring had a high cost per unit and generated only around 50%. Flanagan outlined how this would deliver a surplus of power for many years, which needed to be used to improve productivity and reliability.

It could be argued that the scheme cost NSW consumers plus Commonwealth taxpayers a fortune from over-investment in the 660 MW Units. Was this overinvestment due to Wran's scheme and the lack of critical review by the Commonwealth Loans Council or any independent review?

The Electricity Commission's senior management was undoubtedly pleased with the arrangement's success, especially as the initial concept originated in-house. However, as public servants, these managers could be forgiven for a degree of frustration with the State Government and Premier Wran, who were lauded for the arrangement.<sup>116</sup> At least one senior manager viewed the situation as a further instance of public servants having the power to manage, being blamed for failure yet rarely awarded the glory of success.<sup>117</sup>

The capital works debt incurred by the Electricity Commission demonstrates that providing a vital service is costly and that state and local governments, in the main, were the primary authorities with access to the required financial resources. However, by the early 1980s, with the prospect of the government having to fund billions of dollars for new electricity infrastructure, it is unsurprising that the Wran Labour government was open to alternative avenues for financing Eraring.

### *Eraring is Sold – The Second Time, 2013*

The NSW government decided to sell Eraring Energy in 2013 for several reasons.

First, the government sought to mitigate its exposure to liabilities stemming from the previous Labour government's GenTrader agreement. This agreement guaranteed Origin Energy a certain amount of electricity generation capacity. If Eraring Energy were unable to meet its obligations, it would have to pay Origin substantial sums of money in liquidated damages. The sale of Eraring Energy allowed the state to terminate the GenTrader agreement, effectively eliminating this liability.<sup>118</sup>

Second, the government wanted to avoid developing and operating a coal mine at Cobbora. This mine would have been used to supply Eraring Energy with coal, but the government ultimately decided it was not in the state's best interests to proceed with the project.

Third, the sale of Eraring Energy would generate a net profit of \$75 million for the state. This money could fund other infrastructure projects, such as the WestConnex motorway.

The sale of Eraring Energy was controversial, with some critics arguing that it was a short-sighted decision that would ultimately cost the state more money in the long run. However, the government defended the sale, claiming it was in the state's best interests.

The sale of Eraring Energy was completed in August 2013. Origin Energy, a private company, acquired Eraring Power Station and the Shoalhaven Hydro Scheme for a net payment of \$50 million. The agreed terms for cancellation of the Cobbora Coal Supply Agreement included a payment to Origin of \$300 million.<sup>119</sup> In addition, Origin announced it had entered into a coal supply agreement with Centennial Coal to provide 24.5 million tonnes of coal over eight years from FY 2015 for use at Eraring.<sup>120</sup> Eraring Energy's wind and other hydro assets were transferred to Green State Power, a newly formed entity under the NSW Government.

### *Eraring Nearly Returned to Government Ownership – 2021*

In mid-2021, Origin Energy approached the NSW government with a proposal to transfer ownership and control of Eraring.<sup>121</sup> Origin was facing challenges at the aging power plant, which was already operating at a loss and expected to deteriorate further due to the market shift to renewable energy. The proposal included the government assuming financial responsibility for the plant from 2025 onwards, while Origin committed to building a battery and potentially expanding a pumped hydro facility. Negotiations began in November 2021, but the deal fell apart by December due to government concerns about potential risks and the impact on other energy investments. The government preferred addressing supply shortfalls through extensions rather than committing to a specific timeframe for keeping the plant open. The government's hesitance

to influence market outcomes and the belief that Origin would not shut down the plant if market demand required its operation beyond 2025 were also factors. Following the talks' failure, Origin announced the closure of Eraring in August 2025. The discussions with Origin aimed to secure energy supply certainty for the state as concerns arose over the delay in the Snowy 2.0 project. Origin confirmed the discussions, while the Energy Minister's spokesperson attributed the current energy market situation to external factors rather than future closure dates. The proposed plan involved the government assuming control of the power station from 2023 and covering costs from 2025 until its closure, with Origin operating the plant on the government's behalf.<sup>122</sup> The government offered concessions and committed to purchasing a minimum output from Origin at discounted prices. On one iteration of the plan, a schedule of expected costs prepared by Origin showed it would cost the government just under \$250 million from 2022 until 2027. This included an annual management fee to Origin of \$10 million, while the state would also cover operational and capital costs and would pick up the cost of coal from 2025 onwards. By that time, the government would use revenues from the plant's output—estimated to be about \$240 million a year—to offset costs, for a total cost of \$71 million in fiscal 2026 and \$56 million in 2027.

#### *March 6, 2023 - NSW Labor Floats Buying Back Eraring Power Station<sup>123</sup>*

NSW Labor leader Chris Minns has left the door open to a potential buyback of the Eraring power station to ease prices and an expected supply shortfall after Treasurer Matt Kean flagged the possibility of intervention to keep the power station open past 2025. Mr Minns said he would consider buying back Eraring, the state's largest power station, if Labor won the March 25 election, declaring that selling off the asset had resulted in taxpayers being "fleeced."

#### *July 28, 2023 - Minns Warns Path to Net Zero 'Very Narrow' as Govt Revisits Eraring Closure Date<sup>124</sup>*

Premier Chris Minns has conceded the path to reaching net zero emissions in NSW by 2050 will be "very narrow" while again suggesting the government may buy back Eraring power station to avoid energy shortages.

#### *August 22, 2023 - Eraring Should Remain Open Beyond 2025: Minns Government Energy Review*

On August 22, 2023, the *Sydney Morning Herald* reported that the Minns Labor government's review of the NSW electricity network has recommended the life of Eraring be extended by making a deal with operator Origin Energy.<sup>125</sup>

After months of speculation over the future of Eraring, the *Herald* revealed an Electricity Supply and Reliability Check-Up review commissioned by the new Labor government to assess the state's transition to renewable energy has recommended the power station's operations should be extended beyond its 2025 closure date. The review suggested that the government negotiate with Origin to delay Eraring's closure. The confidential cabinet document says a deal with Origin should be temporary and coupled with an exit policy.

Industry experts estimate prolonging Eraring's operations could cost between \$200 million and \$400 million annually. The move is likely to be welcomed by the industry. Still, any extension would pose a political risk for Labor because it would require taxpayer funds to support a high-polluting coal plant.

#### *Brookfield - 2023*

In 2023, Brookfield and EIG Partners made a bid of \$18.7 billion for Origin Energy. However, the consortium failed to secure sufficient shareholder support, and the bid was rejected.

Brookfield, one of Canada's most prominent private equity-backed investors, envisaged spending an additional \$20 billion to build new renewables and storage, using Origin and its customer base as a vehicle for transition.<sup>126</sup>

AustralianSuper, the chief opponent of the deal, vowed to step in and help fund Origin's move to green energy.<sup>127</sup> The Australian Competition and Consumer Commission had approved the \$18.7 billion takeover bid for Origin, which would have resulted in an accelerated rollout of renewable energy generation, leading to a more rapid reduction in Australia's greenhouse gas emissions. After the rejection of the bid, expectations were that Brookfield and EIG may deliver a reworked takeover bid to buy Origin. However, it was understood that no further action would be taken before Christmas 2023. This was a sensational anticlimax to the proposed deal backed by Origin's chairman and CEO, the rest of Origin's board, and a majority of shareholders.<sup>128</sup>

### ***Eraring 2025 and Closure***

One journalist reportedly commented that AGL's September 2022 decision to close Loy Yang A in the La Trobe Valley ten years early in 2035 resonated through power station workers along the east coast of Australia from Gladstone in North Queensland to the LaTrobe Valley. These workers experienced a similar chill earlier in the year when Origin Energy announced that Eraring would potentially close in 2025, seven years early.<sup>129</sup>

Origin's CEO, Frank Calabria, on February 17, 2022, notified Origin staff:

"We've been talking for some time about Australia's rapid energy transition. The pace of this change will continue to accelerate, bringing both opportunities and challenges for Origin in our sector. As we look towards the future, we have an enormous opportunity to lead the transition to net zero emissions through cleaner energy and customer solutions. This is at the heart of our Origin strategy. But to do this, we need to make significant decisions to position Origin for the future. That's why we've announced the potential retirement of Eraring in mid-2025. Australia's energy market today is very different from the one when Eraring was first brought online in the early 1980s. It has become increasingly clear over the last few years that the influx of renewables has changed the nature of demand for baseload power, undermining the economics of the plant."<sup>130</sup>

He went on to say:

"We have carefully weighed Eraring's future for some time, including extensive consultation with the New South Wales Government to identify what options might exist for the future of the plant. And this doesn't take away from the fact that Eraring is a high-quality generation asset, supplying reliable and affordable energy for decades. We are proud of the role of Eraring in our generation portfolio, which is why making an announcement on the potential earlier closure has not been easy, especially when it may affect the dedicated and passionate people who make up the Eraring team. So, while we know this is the right strategic choice for Origin, our absolute priority is to support our people and consult with them as we work through the potential closure and what this means for them. There is no change today to the Eraring team or operations because of this announcement. Our focus is on continuing to operate the plant safely and flexibly to meet the power needs of our customers and the market."<sup>131</sup>

Calabria also noted that Origin would "continue to assess the market over time, and this will help inform any final decisions on the timing for the closure of all four units."<sup>132</sup> This could be seen as corporate Origin being mindful of the state of the NSW network. On the other hand, a sceptic might have thought it was a throwaway line to cater to all possibilities. Yet by May 2024,

the slower-than-expected expansion of renewables had compelled both Origin and the NSW Government to reconsider Eraring's future, at least for the short term.

### ***Eraring 2027 and Closure***

To support electricity supply security through this period, Origin and the New South Wales Government, in May 2024, agreed to delay the retirement of Eraring Power Station by two years. This agreement balanced maintaining electricity supply security in NSW while compensating Origin if economic conditions for the plant became challenging.<sup>133</sup>

#### **Extension Details**

Under the agreement, Origin will extend Eraring's operations to August 19, 2027. A revised closure notice was submitted to the Australian Energy Market Operator (AEMO), reflecting this new timeline. While Origin retained the right to decide the final closure date for all four units at Eraring, no state compensation was to be paid after FY2027. The plant had to retire completely by April 2029.

#### **Reliable Energy Transition**

When Origin initially submitted the closure notice to AEMO in February 2022, signalling a potential early retirement as soon as August 2025, it recognized the challenges facing traditional baseload power stations. This remained true, and Origin committed to exiting coal generation as soon as there was sufficient renewable energy, firming, and transmission capacity.

The agreement allowed Eraring to continue playing a crucial role in delivering reliable energy during the transition. Origin also accelerated the growth of renewables and storage in its portfolio, including projects at Eraring and Mortlake.

Origin CEO Frank Calabria noted, "We believe this agreement strikes the right balance with an extension to operations enabling Eraring to continue supporting the security of electricity supply in NSW through the energy transition while making compensation available to Origin in the event economic conditions for the plant are challenging."<sup>134</sup>

### **Key Facts**

- Under the Generator Engagement Project Agreement (GEPA), Origin extended Eraring's operations to August 19, 2027, and submitted a revised closure notice to AEMO.
- Origin might receive state compensation to help cover operational costs, generating at least 6 TWh of electricity during FY2026 and FY2027. Origin had to notify the state by March each year to qualify for compensation.
- If the GEPA was triggered, Origin could recover a portion of Eraring's losses based on a formula considering operational and capital costs versus revenue, capped at \$225 million annually. Origin would pay the NSW Government 20% of Eraring's profit if profitable, capped at \$40 million annually.
- Origin retained the right to finalise the retirement timeline for Eraring's units. However, no state compensation would be provided after FY2027, and the plant had to retire by April 2029. If the station were to operate beyond 2027, Ash Dam capacity would be a major constraint.
- Extending Eraring's operations aligned with Origin's 2030 emissions reduction targets and the long-term goal of net zero emissions by 2050, as detailed in our Climate Transition Action Plan.

- Origin continued supporting Eraring employees through a career transition, re-skilling, and redeployment where possible. The \$5 million Eraring Community Fund continued supporting sustainable community projects.
- Update: 1 April 2025<sup>135</sup>
  - *NSW taxpayers have been spared from forking out \$225 million next financial year to keep Australia's largest coal-fired power station running after Origin Energy did not opt into an underwriting agreement with the state government. NSW taxpayers have been spared from forking out \$225 million next financial year to keep Australia's largest coal-fired power station running after Origin Energy did not opt into an underwriting agreement with the state government.*

## Yallourn E and Hazelwood

Victoria's Yallourn E Power Station ceased production in January 1989, and Hazelwood in 2017. These two Victorian power stations are acknowledged through verse and song. These evoke similar thoughts that many may be feeling about Eraring's closure.

### *Yallourn E*

I stand alone on the turbine floor  
 I stand alone on the turbine floor, no other sound but mine.  
 The rows of turbines sit before me, with dust on their once proud shine.  
 I see the gauges with zero faces, charts that sit with dried up ink.  
 The valves that wait with tarnished handles, the stairs that hear no sound of feet.

Then memory brings to me the rumbles, the sounds from the flowing steam.  
 And every station became alive with faces there I had seen.  
 Stories then came back to me of old timers in their prime  
 Punching the clinker, the coal dust rain, the polished brass midst smoke and grime.

Lives were built from within this place, back through time and time before.  
 And men were wed and their children grew and they too walked this floor.  
 From photo, magazines and files I've seen a legend unfold,  
 Learned of men who had the vision and worked towards the goal

I stand alone on the turbine floor, no other sound but mine.  
 Like those who've walked this floor before me,  
 I am the history of this place in time.

Neville J Peckman – January 1991 <sup>136</sup>

The sudden closure of Victoria's Hazelwood Power Station in 2017 prompted Unit Controller Danny Boothman to pen lyrics and music to express how he felt about the station and his nearly three-decade association.<sup>137</sup>

Search YouTube for 'Danny Boothman The Hazelwood Song.'

Hazelwood was a brown coal-fuelled thermal power station located in the Latrobe Valley of Victoria. Built between 1964 and 1971, the 1,600 MW power station comprised eight 200 MW units. On 3 November 2016, Engie, Hazelwood's owner, announced that the power station and the associated substantial brown coal open-cut mine would be closed at the end of March 2017, giving the workers and local communities only five month's notice.

### *The Hazelwood Song*

For many years, she produced the power, a beacon in her time  
 The power she made would light the way in your house and in mine  
 The valley survived the gift of light by the holes we dig in the ground  
 But the time has come to say goodbye after more than a fifty-year run

So, let's all have a drink to Hazelwood, lift your glasses high.  
Let's all have a drink to Hazelwood. It's sad to watch the old girl die.

Now all of us who work here now were are unsure what we we'll do  
But we won't give up because we're made of good stuff,  
we'll do what we have to do  
When the dredges stop, and the fires go out, the Turbines cease to spin  
We'll all have to deal with the winds of change if the winds are blowing again

Let's all have a drink to Hazelwood, lift your glasses high.  
Let's all have a drink to Hazelwood. It's sad to watch the old girl die.

Let's all have a drink to Hazelwood, lift your glasses high.  
Let's all have a drink to Hazelwood. It's sad to watch the old girl die,  
it's sad to watch the old girl die.

Danny Boothman, May 2017



*Figure 111 Eraring Battery Energy Storage System (BESS), 2025  
(Origin Energy)*



*Figure 112 Two Futures, February 2025  
(Ken Thornton)*

## CHAPTER 12 ERARING'S ROLE IN THE ENERGY TRANSITION

Post-2024, Eraring will play a crucial role in supporting the market's transition to renewable energy sources while providing reliable and affordable energy.

### Replacing Eraring's Output

Shutting down a facility like Eraring is a significant endeavour requiring meticulous planning to ensure a smooth transition. With operations potentially to cease in August 2027, there is a need to address the potential supply gap and strategise the site's repurposing. The terrain at Eraring is unsuitable for solar or wind farms, so a large-scale battery is under construction. The first stage of this project is expected to be commissioned in the final quarter of the 2025 calendar year, with a second stage anticipated to come online in early 2027. When completed, the Eraring battery will have a capacity of 700 megawatts.

### Balancing Supply and Demand

Following Eraring's retirement, the energy market must continue to balance supply and demand in real time. Replacing coal-fired power requires a diverse mix of energy sources. While large-scale solar and wind farms are essential, their variable output means additional 'firm' energy sources are needed for a stable supply. This necessitates a significant increase in battery storage. Proposed lithium-ion batteries and pumped storage hydro will play crucial roles alongside gas-fired peaking plants, providing reliable backup.

Maintaining a reliable power supply involves balancing various energy sources in the grid, aiding Origin's steps towards net-zero emissions by 2050. Origin is committed to helping customers reduce their carbon footprint by offering appropriate products and services, recognising that everyone can contribute to cleaner energy.

### Eraring Battery Energy Storage System (BESS)<sup>138</sup>

In May 2022, Origin received planning approval to develop a grid-sized battery at Eraring, with an eventual overall capacity of 700 MW and a dispatch duration of four hours. Stages one and three of the project, involving a 460 MW battery with a two-hour dispatch duration, will come online in late 2025. Stage two has a capacity of 240 MW with a four-hour duration.

### Collaboration with Allegro Energy<sup>139</sup>

In June 2023, Origin announced a 5% equity interest in Newcastle-based clean-tech company Allegro Energy and agreed to pilot their long-duration battery at Eraring. Allegro's Redox Flow Battery (RFB) technology, notable for its water-based composition, is a safer and more environmentally friendly alternative. This collaboration reflects Origin's commitment to innovative solutions during Australia's energy transition.

The initial deployment of a 100 KW (800 kWh) RFB module at Eraring will pave the way for a planned 5 MW (60 MWh) battery, providing 12 hours of energy storage. Construction and commissioning are scheduled for the first quarter of 2025.

## CHAPTER 13 CONCLUSION: A HERITAGE IN ENGINEERING AND HUMAN STORIES

Power stations are among the largest and most recognisable facilities constructed in New South Wales during the 20th century. Although these stations may not physically exist in the future, their legacy certainly will. It is crucial to document both the tangible and intangible aspects of the currently operating electricity generation infrastructure. This has prompted the creation of this history of Eraring,

For over four decades, Eraring has transformed the landscape in terms of its visual, environmental, economic, and cultural aspects. The station has been instrumental in meeting the electricity demands of NSW and the broader eastern Australian network, frequently providing over 25% of the state's power. Its construction was initiated in response to rising electricity sales and anticipated demand growth during the 1980s and 1990s.

Eraring's inception and potential closure serve as bookends to two pivotal eras in New South Wales' electricity generation history. Commissioned during a period of power shortages and blackouts, the first 660 MW generating unit, brought online in 1982, alleviated the power restrictions caused by the 1981 failures at Liddell, providing much-needed relief to NSW consumers. Four decades later, its planned closure marks a key moment in the state's transition to renewable energy.

Eraring distinguished itself from its predecessors through its innovative features and a departure from traditional technologies. Unique design solutions included utilising cooling water from Bonnells Bay under Dora Creek, employing Fabric Filters to address environmental concerns, and incorporating Japanese turbines, generators, and boilers to enhance reliability and availability. These advancements demonstrated the Electricity Commission's commitment to technological progress and environmental responsibility.

In its later years, Eraring underwent significant upgrades and improvements to address rising electricity demand and fulfil its evolving environmental obligations. These projects increased output, enhanced control systems, and reduced greenhouse gas emissions. The station's proactive approach to adapting to new requirements underscored its dedication to providing reliable and sustainable energy.

The legacy of those who have worked and continue to work at Eraring is multifaceted, reflecting their contributions to the energy sector, the local community, and the broader narrative of industrial progress and transition in energy production. They have played a crucial role in maintaining and operating Australia's largest power station, and their expertise has been essential in meeting the energy needs of New South Wales. This expertise significantly contributes to the reliability and stability of the region's power supply.

The power station has been a significant employer in the Newcastle, Lake Macquarie, and Central Coast regions, supporting families and bolstering the local economy for over four decades. The workforce's role in sustaining the local economy is critical to the station's legacy.

As environmental awareness increased, Eraring employees adapted by incorporating new technologies and practices to minimise environmental impacts. Their efforts in implementing emission-reduction technologies and reducing the station's potable water consumption are notable examples of their commitment to environmental stewardship. Employees at Eraring have also been integral to the local community. Beyond their professional

roles, they have participated in community activities, supported local causes, and fostered a sense of solidarity and support in the region, shaping the area's social fabric.

The personal experiences and memories of former and current employees underscore the individual nature of their relationship with the station. While some found Eraring an exceptional workplace where they forged lasting relationships and received top-notch training, others were drawn to the station's technical complexities, viewing it as a serious 'toy' to engage with. However, some may have faced challenges or regarded it merely as a means of livelihood.

Many who have worked at the power station have shared their knowledge and experience, contributing to educating new generations of operators, engineers, maintenance staff, administrators, and technicians. This mentorship and knowledge transfer ensure that their expertise continues to influence the industry long after their direct involvement. After departing Eraring, many have shared their knowledge and expertise with power production personnel across state lines and internationally.

Facing the potential closure of the station in late 2027, those involved in the production process were understandably anxious about their future. However, those with an Origin-wide perspective may be less concerned.

In summary, the legacy of those who have worked at Eraring encompasses a blend of industrial achievement, community impact, environmental adaptation, and knowledge sharing. Their contributions extend beyond the confines of the power station, influencing the energy sector, local communities, and the broader narrative of energy production in Australia.

While Eraring has achieved notable successes, it has also experienced unfortunate incidents resulting in the loss of life. These tragic events prompted revisions to state and local safety regulations and served as sober reminders of the risks associated with the station's operations. These incidents underscore the importance of adhering strictly to safety protocols.

Looking ahead, Origin Energy's announcement about the potential closure of Eraring in 2027 marks a significant turning point for the station. The closure raises questions about the future of the high-quality equipment, its impact on employees, and the memories and emotions associated with their time at Eraring. This closure is not merely an economic or environmental issue but a deeply personal matter for those whose lives, livelihoods, and sense of belonging are intricately linked to the station.

As discussions and reflections on Eraring's 40-plus-year journey continue, ongoing research and conversations with former and current employees will contribute to a more comprehensive understanding of the station's legacy. Ultimately, Eraring will be remembered as a groundbreaking facility that made a significant contribution to NSW's electricity generation history, embodying a blend of technological innovation and employee dedication in the evolving energy landscape.

## **Closing Thoughts: A Journey's End**

As noted elsewhere, in the early 1980s, the anticipated lifespan of Eraring was expected to be around 50 years, marking its potential closure around the early to mid-2030s. However, the rapid evolution of the energy sector, particularly the rise of renewable energy sources, has significantly impacted the station's operational timeline. In 2022, Origin Energy, the operator of Eraring, announced its intention to close the station in August 2025. This decision was primarily driven by the growing influence of renewable energy on the economics of traditional power station operations. The increasing affordability and efficiency of solar, wind, and other renewable sources have made it more challenging for coal-fired stations like Eraring to remain economically viable.

Yet, the story of Eraring's closure did not end there. In mid-2024, a new chapter unfolded when the New South Wales government and Origin Energy agreed to extend the station's operational life until at least mid-2027. Concerns over the stability of the electricity grid and the ongoing transition to renewable energy sources influenced this decision. The government recognized the need for a reliable energy supply during this transitional period, and Eraring's continued operation was deemed necessary to ensure grid stability. At that time, both agreed that 2029 would be Eraring's last year. Both cited the 2030 emissions target as the prime factor in this decision.

Nonetheless, three months later, in August 2024, the *Newcastle Herald* suggested that, depending on the progress of the renewable energy transition, Origin Energy was considering further extensions beyond 2029.<sup>140</sup> This uncertainty highlights the complexities of transitioning from traditional energy sources to renewables and the challenges of ensuring a seamless transition while maintaining a reliable power supply.

The evolving timeline of Eraring Power Station reflects broader trends in the global energy sector. It highlights the delicate balance between transitioning to cleaner energy and maintaining energy security. As the world continues to grapple with the challenges of climate change, the story of Eraring serves as a microcosm of the broader energy transition, illustrating the uncertainties, challenges, and decisions that will shape our energy future.



*Figure 113 Across Lake Eraring  
(ECNSW)*

## Acknowledgements

Without the contributions of many willing people, "Eraring: A Technical and Social History" would never have come to fruition. One name may appear on the cover, but the end product is more accurately a team effort. While not commissioning this project, I would like to thank Origin Energy for granting access to the Eraring site, its personnel, and the power station's archives.

I am grateful to everyone who kindly completed the online history survey or allowed me to conduct an interview with them. I acknowledge the help of Paul Duboudin, Origin's Senior Manager External Affairs, Communities; Steven Rigby, Origin's General Manager, Generation and Energy Transition; Antony Cotic, Eraring's Asset Services Manager and Suze McDonald, Eraring's Site Support Coordinator. The Generation Information Management team of Meg Trehwella, Madison Le Merton, Jenny Leech, and Rob Nicol have been a great help in my working through the 'mountains' of pre-privatisation documentation held at Eraring. They have also assisted me in learning about the complexities of Origin's corporate information management system.

I am indebted to many current and former Eraring people for coming to the rescue when clarification of obscure Eraring details was required. These included Shift Managers Troy Locke and Sam Brayley for clarifying operator and operational matters. Peter Lyons and Craig Macclure explained several engineering matters. Yet, all errors and deficiencies are my own.

Several non-Origin people and organisations were forthcoming with valuable help:

- Peter Lewis and the *Newcastle Herald* for a cartoon.
- Museums of History New South Wales – State Archives Collection: Electricity Commission of New South Wales, NRS 20347 Photographic Collection. NRS-20347. All ECNSW, Pacific Power and Eraring Energy images are inferred to have the following prefix 'MHNSW-StAC: NRS-20347-1-27-xxxxx'.

A complete account of Eraring's history would need a series of books, so this one can only point out some of the more significant events and activities. Ultimately, this is 'a' history, not 'the' history of the station.

But why research and write a history of Munmorah, Liddell, and Eraring? Ten years at Liddell and 30 at Eraring undoubtedly had a bearing. Most commentators on the industry write about its political, economic, organisational, or technical aspects. None adequately acknowledge the contributions of thousands of people associated with the industry over the twentieth century, including the ECNSW/Pacific Power from 1950 to 2003, Eraring Energy to 2013, and Origin Energy to the present. Specifically, Eraring people are rarely mentioned.

I am mindful of my prejudices in selecting material and their interpretation. This is especially true of my third career at the station (2022 – 2024). Much of what I found differed from what I remembered. So, I reasoned that if the differences interested me, they would undoubtedly interest former employees.

Some readers might find this history too technical or lacking in human interest. It may also focus more on Operator or Management than Maintenance or Administration stories. Historians can only work with the information they discover or are presented. Many people knew that this history was being researched and written. I interviewed over 70 people with an Eraring connection. I hope those who spoke with me received a fair hearing, and I thank them for their contributions.

I have sourced the material in good faith and with due care. Every effort has been made to ensure that sources are correctly cited and follow the Archive User Agreement I have with Origin

Energy. Where appropriate, I have endeavoured to cross-check controversial information. Additionally, where necessary, every effort has been made to obtain the approval of the copyright owners of the material. That said, the author accepts no responsibility for the accuracy of oral histories or names in photographs generously supplied by people who have contributed to this work. Some contributors wished to remain anonymous, and I have de-identified some contributions where I felt identification might be unwelcome or inappropriate. I have endeavoured to cite all sources of information, be they archives, newspapers, books, journals, or oral histories.

Origin Energy did not commission this history. In late 2017, I published a history of Munmorah Power Station to celebrate its 50th anniversary. A history of Liddell followed in April 2023 to commemorate that station's closure. In early 2021, I asked Origin if the company would assist in researching the station's history. In late 2022, I was granted access to the site and the station's archives. As Eraring is slated to operate till at least 2027 or maybe 2029, this is only viewed as a First Edition.

Ken Thornton, 28 October 2025

## Research participants

| Participant       | Last known Eraring Position                                        |
|-------------------|--------------------------------------------------------------------|
| Aaron Bodley      | Contracts Management                                               |
| Adela Murphy      | Financial Systems Accountant                                       |
| Ash Baweja        | Turbine Contracts Engineer                                         |
| Bill Cormick      | Boiler Maintenance Engineer (ECNSW)                                |
| Bob Porter        | Mechanical Engineer (ECNSW)                                        |
| Brett Murphy      | Ash Strategy                                                       |
| Brian Staples     | PPO                                                                |
| Cory Francisco    | Ash Dam Operations and Maintenance                                 |
| Craig Macclure    | Principal Mechanical Engineer (Origin Energy)                      |
| Dave Tod          | Operations Section Technical Officer.                              |
| Dave Williams     | Eraring Power Station Manager (Pacific Power, Eraring Energy)      |
| David Hails       | APPO                                                               |
| David Russell     | Engineer                                                           |
| David Whan        | Grade 2 Turbine Engineer (ECNSW)                                   |
| Diane Moriarty    | Business Services Officer Central Coast Generation (Pacific Power) |
| Fred Seysener     | Senior Plant Owner                                                 |
| Gary Patterson    |                                                                    |
| Geoff Byrnes      | Outage Coordinator (Origin Energy)                                 |
| Gerry Grove-White | Managing Director (Eraring Energy)                                 |
| Greg Johnstone    | APPO (Origin Energy)                                               |
| Ian Dawson        | Senior Turbine Plant Owner and Contract Administrator (Eraring     |
| Jamie Bradley     |                                                                    |
| Jim Davies        | Shift Manager                                                      |
| John Asquith      | Manager                                                            |
| John Howard       | PPO Relief Shift Manager (Pacific Power)                           |
| John Kempnich     | Engineer (ECNSW), Contractor (Aurcon)                              |
| Julie Virtue      | Administration Officer (Eraring Energy)                            |
| Kate Coates       | Executive Manager Hydro & Wind (Eraring Energy)                    |
| Kelly Tuimauauala | Mechanical Maintenance Coordinator                                 |
| Kevin Parker      | CPO                                                                |
| Laurie Thompson   | Operations Training Specialist (Origin Energy)                     |
| Les Rowlandson    | Boiler Plant Owner                                                 |
| Mark Finlay       | Acting Charge Engineer (Pacific Power)                             |
| Matt Davies       | Principal Advisor Environment                                      |
| Michael Wright    | Payroll Officer (Pacific Power)                                    |
| Neil Harvey       | Eraring Power Station Vocational Trainer (Origin Energy)           |
| Neil Morris       | Production Manager (Origin Energy)                                 |
| Noel Collins      | Manager, Major Asset Lifecycle (Origin Energy)                     |
| Paul Hamilton     | Power Worker                                                       |
| Paul Pace         | Principal Advisor, Generation, and Development (Origin Energy)     |
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| Peter Jackson     | Eraring Energy Managing Director                                   |
| Peter Kane        |                                                                    |
| Peter Lyons       | Reliability Engineer (Origin Energy)                               |
| Peter Smith       | Production Manager / Acting Manager                                |
| Peter Wells       |                                                                    |
| Phil Moriarty     | Human Resources Manager (Eraring Energy)                           |

|                   |                                                                  |
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| Phil Turner       | Operations Assistant (ECNSW)                                     |
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| Robert Williamson | Senior plant engineer, Controls and Cyber team.                  |
| Rod Moulder       | Fleet Services Coordinator                                       |
| Roger Gethings    | Rigger, Crane Driver, Scaffolder, Tool Storeman                  |
| Ron Astley        | Charge Engineer (ECNSW)                                          |
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| Sam Brayley       | Shift Manager (Origin Energy)                                    |
| Scott Davis       | Senior Business Analyst                                          |
| Shannon Logue     | Production Coordinator                                           |
| Shaun Edwards     | Manager (Origin Energy)                                          |
| Steve Gambrill    | Safety Manager                                                   |
| Steven Rigby      | General Manager Generation and Energy Transition (Origin Energy) |
| Steve Wheeler     | Operations Engineer                                              |
| Terry Byrnes      | Shift Manager                                                    |
| Terry Plunkett    | Construction Engineer (ECNSW)                                    |
| Tom Hamilton      | Site Surveillance Safety Officer                                 |
| Tony Phillips     | Group Manager, Coal Asset Operations (Origin Energy)             |
| Trevor Core       | Mechanical inspector for oil and gas companies                   |
| Troy Locke        | Shift Manager (Origin Energy)                                    |
| Warwick Elliott   | Chemist                                                          |

## Name Index

|                                                |                             |
|------------------------------------------------|-----------------------------|
| Aratchige, Methsiri, 94                        | Lang, Robert, 133           |
| Beesley, Jack, 58                              | Lawley, Peter, 58           |
| Bradley, Jamie, 139                            | Le Merton, Madison, 189     |
| Brady, Frank, 50, 120, 121                     | Leech, Jenny, 189           |
| Brayley, Sam, 22, 189                          | Locke, Troy, 138, 189       |
| Bunyon, Ross, 131, 132                         | Lyons, Peter, 24, 189       |
| Byrnes, Geoff, 137                             | Macclure, Craig, 189        |
| Casey, Peter, 157                              | Maher, Jack, 38             |
| Coady, A.W.B, 51                               | Mahood, Rod, 157            |
| Coates, Kate, 139                              | McCulloch, George, 120, 121 |
| Conde, H.G., 52                                | Moriarty, Diane, 137, 139   |
| Cotic, Antony, 189                             | Morris, Neil, 138           |
| Davies, Jim, 14                                | Murphy, Adela, 137          |
| Dawson, Ian, 139                               | Murphy, Brett, 138          |
| Duboudin, Paul, 189                            | Nicol, Rob, 189             |
| Dunwoodie, Stu, 94                             | Oakley, Alan, 157           |
| Dyson, John, 131                               | Rhiannon, Lee, 134          |
| Egan, Michael, 132                             | Rigby, Steven, 12, 189      |
| Finlay, Mark, 139                              | Riordan, Bernie, 133        |
| Fitzgerald, Alan, 140                          | Seysener, Fred, 137, 138    |
| Flanagan, Barry, 129                           | Shields, Alan, 38           |
| Francisco, Corey, 149                          | Stobbs, Frank, 100          |
| Francisco, Niamh, 149                          | Sykes, Fred, 51             |
| Garland, Ralph, 133                            | Thompson, Laurie, 138, 139  |
| Gay, Duvan, 133                                | Thornton, Ken, 14, 139, 157 |
| Graham, Peter, 130                             | Tod, Dave, 137, 138         |
| Grove-White, Gerry, 11, 14, 134, 147, 159, 162 | Trehwella, Meg, 189         |
| Harvey, Neil, 138, 139                         | Wheelahan, Michael, 138     |
| Hennes, Jim, 131                               | Whipp, Norm, 140            |
| Hollis, Ron, 98                                | Williams, Dave, 137, 139    |
| Hunter, Jeff, 134                              | Wran, Neville, 120, 121     |
| Jackson, Neil, 157                             | Wright, Michael, 138, 139   |
| Jackson, Peter, 159                            | Zerbes, John, 102           |
| Johnstone, Greg, 138, 139                      |                             |

## Glossary

| Abbreviation | Definition                                 |
|--------------|--------------------------------------------|
| ATAR         | Access To Apparatus Rules                  |
| APPO         | Assistant Power Plant Operator             |
| ECNSW        | Electricity Commission of New South Wales  |
| EE           | Eraring Energy                             |
| HP           | High Pressure                              |
| LP           | Low Pressure                               |
| NASA         | National Aeronautical Space Administration |
| PF           | Pulverised Fuel                            |
| PP           | Pacific Power                              |
| PPO          | Power Plant Operator                       |

|    |               |
|----|---------------|
| SM | Shift Manager |
|----|---------------|

## List of Figures

|                                                                                                                 |    |
|-----------------------------------------------------------------------------------------------------------------|----|
| Figure 1 Transformer Bay, March 1982 .....                                                                      | 9  |
| Figure 2 From the south-east, 2007.....                                                                         | 9  |
| Figure 3 Units 3 & 4 under construction between November 1982 and July 1983 .....                               | 10 |
| Figure 4 A few of the thousands who have, and continue to work at Eraring, July 2023.....                       | 10 |
| Figure 5 Gerry Grove-White .....                                                                                | 11 |
| Figure 6 Steven Rigby .....                                                                                     | 12 |
| Figure 7 Jim Davies .....                                                                                       | 14 |
| Figure 8 From 500 feet .....                                                                                    | 15 |
| Figure 9 From the north.....                                                                                    | 16 |
| Figure 10 High Voltage Switchyard across the High-Level Canal .....                                             | 17 |
| Figure 11 Welcome to Eraring, 2025.....                                                                         | 18 |
| Figure 12 "I am complaining about Eraring's size increase. Haven't they got any sense of responsibility?" ..... | 20 |
| Figure 13 At Night, January 2022 .....                                                                          | 22 |
| Figure 14 Dusk.....                                                                                             | 22 |
| Figure 15 "and on the ....th day, God said," 2023.....                                                          | 24 |
| Figure 16 Aerials, post 1984 and January 1981 .....                                                             | 24 |
| Figure 17 Unit 1 Turbine-Generator, 2024 .....                                                                  | 25 |
| Figure 18 Pipework in the basement, February 2023.....                                                          | 26 |
| Figure 19 Pipework in the basement, February 2023.....                                                          | 26 |
| Figure 20 Original 1982 Turbine Nameplate. ....                                                                 | 27 |
| Figure 21 Turbine Nameplate, February 2023.....                                                                 | 27 |
| Figure 22 Low Pressure (LP) Heaters, November 2024.....                                                         | 28 |
| Figure 23 Low-Pressure and High-Pressure Feedwater Heaters, November 2024.....                                  | 28 |
| Figure 24 High Pressure (HP) Heaters, November 2024.....                                                        | 29 |
| Figure 25 Coal Feeders, November 2024 .....                                                                     | 30 |
| Figure 26 Steam Feed Pump Turbine, February 2023 .....                                                          | 31 |
| Figure 27 Mezzanine Floor November 2024 .....                                                                   | 32 |
| Figure 28 Pulverising Fuel Ball Mill, November 2024 .....                                                       | 33 |
| Figure 29 The Dry Ash Removal system was not originally fitted. November 2024.....                              | 34 |
| Figure 30 The Auxiliary Cooling Water Towers sit on a small hill to west of the station. November 2024 .....    | 34 |
| Figure 31 Feedwater Heaters, November 2024 .....                                                                | 35 |
| Figure 32 Site location. Above in relation to Lake Macquarie. Below alternative sites.....                      | 36 |
| Figure 33 Jack Maher, first Power Station Superintendent, October 1981.....                                     | 38 |
| Figure 34 Alan Shields, first Assistant Power Station Superintendent, October 1981.....                         | 38 |
| Figure 35 From the southwest, June 1984.....                                                                    | 41 |
| Figure 36 The generator rotor was removed for inspection. ....                                                  | 43 |
| Figure 37 Turbine Floor, June 1984 .....                                                                        | 43 |
| Figure 38 Pymont B.....                                                                                         | 44 |

|                                                                                                                                                                      |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 39 Frank Brady, August 1984. General Manager of the Electricity Commission when Eraring was opened.....                                                       | 50  |
| Figure 40 Toshiba turbine nameplate, 2023.....                                                                                                                       | 54  |
| Figure 41 Turbine Floor, November 1980 .....                                                                                                                         | 55  |
| Figure 42 Generation, Design and Construction Groups, 1982.....                                                                                                      | 59  |
| Figure 43 Units 1 and 2 under construction in 1980.....                                                                                                              | 61  |
| Figure 44 Eraring Simulator, August 1981.....                                                                                                                        | 65  |
| Figure 45 Initial Loading of Unit 1. ....                                                                                                                            | 66  |
| Figure 46 Polishing Plant, January 2025.....                                                                                                                         | 69  |
| Figure 47 Coal Conveyors.....                                                                                                                                        | 70  |
| Figure 48 Coal Stacker/Reclaimer.....                                                                                                                                | 73  |
| Figure 49 Coal Stack, May 1984 .....                                                                                                                                 | 73  |
| Figure 50 Alan Williams working on the Stacker Reclaimer .....                                                                                                       | 74  |
| Figure 51 Coal conveyor from Myuna Colliery, March 2007.....                                                                                                         | 75  |
| Figure 52 Boiler side elevation prior to 720/750 MW upgrade.....                                                                                                     | 76  |
| Figure 53 Pulverising Fuel Ball Mill, November 2024 .....                                                                                                            | 77  |
| Figure 54 IHI 660 MW Steam Generator, McLaren.....                                                                                                                   | 78  |
| Figure 55 Fabric Filters, November 2024.....                                                                                                                         | 79  |
| Figure 56 Turbine Generator, March 1982.....                                                                                                                         | 80  |
| Figure 57 Cooling water cassion being floated into place before being sunk into a trench in Dora Creek, January 1980.....                                            | 82  |
| Figure 58 High-Level Canal .....                                                                                                                                     | 83  |
| Figure 59 High-Level Canal overflowing, October 2024.....                                                                                                            | 83  |
| Figure 60 Cooling Water from the High-Level Canal to the Main Condensers, November 2024 .....                                                                        | 84  |
| Figure 61 Cooling Water Outlet Canal discharging into the tunnel to Myuna Bay, December 2024.....                                                                    | 84  |
| Figure 62 Steam pipes to and from boiler, 2023 .....                                                                                                                 | 87  |
| Figure 63 Ash and Dust slurry pipes .....                                                                                                                            | 90  |
| Figure 64 Mike Melidonis and Ralph Watts, at the synchronising of Unit 4 April 1984.....                                                                             | 91  |
| Figure 65 Neil Harvey and others relocating a Green Turtle from the Inlet Canal.....                                                                                 | 91  |
| Figure 66 LP Turbine rotor, November 2024.....                                                                                                                       | 92  |
| Figure 67 330kV transmission line, May 1969.....                                                                                                                     | 93  |
| Figure 68 330kV Transmission Tower, February 1961.....                                                                                                               | 95  |
| Figure 69 Generator equipment being off-loaded in Newcastle, January 1980 .....                                                                                      | 96  |
| Figure 70 Extract from Eraring's Job Sheet B4/1, outlining pre-start procedures for a PF System, showing the steps required to ensure its operational readiness..... | 99  |
| Figure 71 Original Seimens control panel for Units 1 and 2. PPO Frank Stobbs is in the foreground .....                                                              | 100 |
| Figure 72 All four units in one PCR. One PPO per Unit.....                                                                                                           | 101 |
| Figure 73 One PPO for two Units and a third PPO monitoring Station Plant to the right ..                                                                             | 101 |
| Figure 74 Doris screen shots.....                                                                                                                                    | 103 |
| Figure 75 Coal Plant Stacker /Reclaimer (Eraring Energy) .....                                                                                                       | 105 |
| Figure 76 Shelves of Document Boxes in one of the station repositories, 2024 .....                                                                                   | 106 |
| Figure 77 Loose documents in an empty office, 2023 .....                                                                                                             | 107 |
| Figure 78 Boiler 'Dance Floor', October 2023.....                                                                                                                    | 110 |

|                                                                                                                                                                      |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 79 Unit Outage, 2024 .....                                                                                                                                    | 111 |
| Figure 80 Origin Unit Outage Crew .....                                                                                                                              | 112 |
| Figure 81 High Voltage Switchyard over High-Level Canal .....                                                                                                        | 113 |
| Figure 82 Small, but there are major consequences if operated .....                                                                                                  | 114 |
| Figure 83 Main Receiving Bin under construction, May 1981 .....                                                                                                      | 115 |
| Figure 84 Open cut site location .....                                                                                                                               | 116 |
| Figure 85 This is the type of development the Lake Macquarie community were advocating against. Hebden Open Cut Mine near Liddell Power Station, February 1972 ..... | 118 |
| Figure 86 Newstan is an underground mine feeding Eraring, October 1960 .....                                                                                         | 119 |
| Figure 87 Premier Neville Wran officially opening Eraring, 29 June 1984 .....                                                                                        | 120 |
| Figure 88 PPO George McCulloch explaining a technical point to Premier Wran and ECNSW General Manager Frank Brady, 29 June 1984 .....                                | 120 |
| Figure 89 Plaque noting the opening of Eraring .....                                                                                                                 | 122 |
| Figure 90 Invite the Opening, June 1984 .....                                                                                                                        | 122 |
| Figure 91 Guinness Book of Records certificate noting Unit 4's world record .....                                                                                    | 124 |
| Figure 92 (ECNSW) .....                                                                                                                                              | 127 |
| Figure 93 First Aid competition .....                                                                                                                                | 136 |
| Figure 94 Pacific Power's 1996 Annual Report cover celebrating Unit 4's world record .....                                                                           | 136 |
| Figure 95 25 <sup>th</sup> anniversary (unit 1), 2007 .....                                                                                                          | 143 |
| Figure 96 30 <sup>th</sup> anniversary (unit 1), 2012 .....                                                                                                          | 143 |
| Figure 97 40 <sup>th</sup> anniversary (opening), 2024/2025 (Origin Energy) .....                                                                                    | 143 |
| Figure 98 Assistant PPO training school, August 1981 .....                                                                                                           | 146 |
| Figure 99 A portion of the Ash Dam. The mound in the centre is stockpiled ash being prepared for sale .....                                                          | 149 |
| Figure 100 Boiler Electrical Maintenance Team .....                                                                                                                  | 151 |
| Figure 101 Operation Support .....                                                                                                                                   | 151 |
| Figure 102 Chinese Operators from Beilungang Power Station, March 1990 .....                                                                                         | 152 |
| Figure 103 Coal conveyor floor with Tripper in the foreground, 2025 .....                                                                                            | 155 |
| Figure 104 Early Operator Training School, August 1981 .....                                                                                                         | 157 |
| Figure 105 Electricity Commission Safety Rules .....                                                                                                                 | 162 |
| Figure 106 The Attemperating Pond is filled from the High-Level Canal and discharges into it when the outfall canal water needs to be cooled. ....                   | 168 |
| Figure 107 Across the Atemperring Pond (Origin Energy) .....                                                                                                         | 168 |
| Figure 108 (Peter Trimmer) .....                                                                                                                                     | 169 |
| Figure 109 Presentation to Westpac Rescue Helicopter Service, December 2024 .....                                                                                    | 170 |
| Figure 110 Wangi Power Station, 2023 .....                                                                                                                           | 172 |
| Figure 111 Eraring Battery Energy Storage System (BESS), 2025 .....                                                                                                  | 184 |
| Figure 112 Two Futures, February 2025 .....                                                                                                                          | 184 |
| Figure 113 Across Lake Eraring .....                                                                                                                                 | 188 |

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## Notes

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