Modification Report: Use of diesel fuel during first year of operation

Revision: D

Snowy Hydro

Hunter Power Project: SSI-12590060
5 September 2024

Modification Report: Use of diesel fuel during first year of operation

Client name:	Snowy Hydro	**Project no:**	IS354501
Project name:	Hunter Power Project: SSI-12590060	**Project manager:**	K Ivanusic
Revision:	D	**Prepared by:**	S Cornell, M Luger
Date:	5 September 2024	**File name:**	HPP_Mod 3 report_Diesel fuel operation in year 1_240905

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
A	16/08/2024	Draft	S. Cornell	M. Luger	M. Luger	
B	29/08/2024	Final draft	S. Cornell	M. Luger	M. Luger	
C	04/09/2024	Updated final draft	S. Cornell	M. Luger	M. Luger	
D	05/09/2024	Final	S. Cornell	M. Luger	M. Luger	I. Boardman

Acknowledgement of Country

Jacobs proudly acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Owners of the lands upon which each Jacobs office is located and those upon which we operate. We recognise that Traditional Owners have cared for and protected these lands for thousands of generations. Traditional Owners always have and always will have strong cultural, social and spiritual connections to the lands, skies, and waters. Jacobs respectfully recognises the Ancestors and Elders, past, present, and future. We acknowledge that sovereignty was never ceded and we are committed to working towards reconciliation.

Jacobs Group (Australia) Pty Limited

Level 7, 177 Pacific Highway
North Sydney, NSW 2060
PO Box 632
North Sydney, NSW 2059
Australia

T +61 2 9928 2100
F +61 2 9928 2444
www.jacobs.com

Executive summary

The Hunter Power Project (the 'project') was approved as SSI-12590060 by the New South Wales (NSW) Minister for Planning and Public Spaces on 17 December 2021. The approved project involves the development of a gas-fired power station comprising two open cycle gas turbine generators with a nominal capacity of up to 750 megawatts, an electrical switchyard and associated supporting infrastructure. The project is being developed on a small portion of the former Hydro Aluminium Kurri Kurri aluminium smelter site in Loxford, about three kilometres north of the town of Kurri Kurri, within the Cessnock City Council local government area.

Construction of the pipeline that will supply natural gas to the power station has experienced delays that will result in the power station being ready to start commissioning before gas can be supplied to the plant. Under the current program, commissioning of the power station is expected to commence in late 2024, but construction of the gas pipeline is not expected to be completed until late 2025. The delay in construction of the pipeline is due to a combination of factors that include the time taken for a pipeline licence to be granted under the *Pipelines Act 1967*, and construction delays caused by wet weather, hot weather and industrial action.

Conditions A8 and A9 of the approval for the project place the following limits on the operation of the gas turbines:

- *A8 — Fuel burning equipment must not be operated for the purpose of generating electrical power at the premises for more than 1,100 cumulative hours per calendar year*
- *A9 — Fuel burning equipment must not be fired on diesel for the purpose of generating electrical power at the premises for more than 175 cumulative hours per calendar year.*

The proponent, Snowy Hydro Limited (Snowy Hydro) an Australian Government owned corporation, is seeking approval of a modification to the project to allow each gas turbine to operate for up to 1,100 cumulative hours on diesel fuel in calendar year 2025 (the 'proposed modification'). The proposed modification would require temporary relief from condition A9.

The environmental impact statement (EIS) of the project assessed the impacts of the power station operating on either gas or diesel fuel. Therefore, the proposed modification would not result in impacts that exceed the intensity of the impacts assessed in the EIS.

When the gas turbines operate on diesel fuel it results in different air quality, greenhouse gas emission, noise, traffic, water consumption and waste impacts compared to when they operate on natural gas. This report has assessed the impacts of the proposed modification on these environmental factors relative to those assessed in the EIS and identified that:

- Air quality — The EIS included modelling of a scenario of both gas turbines being operated concurrently at maximum (100 per cent) loading on diesel fuel for every hour of an annual meteorological simulation. The air quality impacts of the proposed modification are therefore already assessed in the EIS. The modelling carried out for the EIS has been reviewed against more recent local background air quality conditions, which have generally improved since the previous assessment, and more stringent air quality impact assessment criteria introduced since the EIS. This found that air emissions from the project would remain below current impact assessment criteria. A current satellite image of the project site locality was also reviewed and this confirmed that there are no new sensitive receptors nearer to the project site than those included in the EIS modelling, and therefore the existing set of 16 sensitive receptors are still representative.
- Greenhouse gas emissions — The proposed modification would result in an about 80 per cent increase in greenhouse gas emissions compared to an update of the scenario for year 1 emissions presented in the EIS. This is due to the combustion of diesel and because the proposed modification would entail an increase in the maximum number of operating hours during the first year. Comparing the proposed modification to an update of the scenario for greenhouse gas emissions presented in the EIS for years 2 to 30 where the operating hours are the same, the proposed modification would result in 33 per cent

more greenhouse gas emission per megawatt of electricity generated, and an eight per cent increase in the greenhouse gas emissions per hour of operation

- Noise — Operational noise emissions were modelled in the EIS based on an operational scenario that included all identified operational noise sources listed, including those associated with the gas turbines operating on diesel fuel. The noise impacts of the proposed modification are therefore already assessed in the EIS.
- Traffic — The EIS estimated that refilling (or emptying) of the diesel fuel storage tanks would generate a maximum of 12 B-double tanker movements per day (comprising six inbound trips and six outbound trips) between approximately 8:00 am and 4:00 pm. This would need to increase in 2025 to a maximum of 24 tanker movements per day (12 inbound trips and 12 outbound trips) between 6:00 am and 6:00 pm in the event that the number of hours of operation on diesel fuel is high. Additionally, there would be a small increase in truck movements associated with additional water treatment chemicals and the additional waste generated by the power station when it operates on diesel fuel compared to natural gas. The surrounding road network has capacity to accommodate the relatively low increase in operational traffic
- Water — Operation on the gas turbines on diesel fuel consumes more water than operation on natural gas. The proposed modification would result in the consumption of up to about 235 megalitres of water in 2025 based on each gas turbine operating for 1,100 hours on diesel fuel. This is 155 megalitres more than the EIS estimated power station water demand of about 80 megalitres per annum based on each gas turbine operating for 876 hours on natural gas and 175 hours on diesel fuel. The increase in water demand in 2025 would not require an increase in the rate at which Hunter Water has agreed to supply water to the power station.
- Waste — Operation of the gas turbines using diesel fuel results in some liquid waste from the demineralisation plant that will be managed as trade waste subject to a trade waste agreement between Snowy Hydro and Hunter Water. The EIS included an estimate of 16.2 megalitres of wastewater per annum based on each gas turbine operating for 876 hours on natural gas and 175 hours on diesel fuel. The proposed modification is estimated to generate about 34 megalitres of wastewater in 2025 based on each gas turbine operating on diesel fuel for 1,100 hours. The maximum rate at which wastewater is produced would remain the same, only the duration of wastewater production would increase.

The proposed modification would not result in a change to the Project's impacts to other environmental factors.

The above impacts of the proposed modification are worst-case impacts, noting that the assessment of 1,100 hours of operation of each gas turbine on diesel fuel during 2025 is substantially greater than the actual number of hours of operation that the gas turbines are likely to be operated in a typical year, and also once construction of the gas pipeline is completed the turbines would be operated on natural gas in preference to diesel fuel, based on the availability of natural gas.

Contents

Appendices

Tables

Acronyms and abbreviations

2016 Approved Methods	*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW Environment Protection Authority, 2016)
2022 Approved Methods	*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW Environment Protection Authority, 2022)
APA	APA Group (formerly Australian Pipeline Trust)
CO	Carbon monoxide
CO_2	Carbon dioxide
Commonwealth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DPHI	NSW Department of Planning, Housing and Infrastructure
EIS	Environmental impact statement
EPA	NSW Environment Protection Authority
EP&A Act	(NSW) *Environmental Planning and Assessment Act 1979*
EPBC Act	(Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environmental protection licence
FTE	Full time equivalent
km	Kilometre
kV	Kilovolt
m^3	Cubic metre
ML	Megalitre
MW	Megawatt
NEPM	National Environment Protection Measure
NEM	National Energy Market
NO_2	Nitrogen dioxide
$PM_{2.5}$	Particulate matter with a diameter of 2.5 micrometers or less
SEARs	Secretary's environmental assessment requirements
SO_2	Sulfur dioxide
SSI	State significant infrastructure

1. Introduction

The Hunter Power Project (the 'project') involves the development of a gas-fired power station comprising two open cycle gas turbine generators with a nominal capacity of up to 750 megawatts, an electrical switchyard and associated supporting infrastructure. The project is being developed on a small portion of the former Hydro Aluminium Kurri Kurri aluminium smelter site in Loxford, about three kilometres north of the town of Kurri Kurri, within the Cessnock City Council local government area. The power station is designed to operate as a 'peak load' generation facility capable of supplying electricity at short notice when there is a requirement in the national electricity market (NEM) such as during periods of high electricity demand, low supply periods from intermittent renewable sources, supply outages at baseload power stations, and transmission line constraints or outages.

The proponent of the project is Snowy Hydro Limited (Snowy Hydro), an Australian Government owned corporation. Snowy Hydro prepared an environmental impact statement (EIS) for the project that was publicly exhibited in May-June 2021. The project was approved by the New South Wales (NSW) Minister for Planning and Public Spaces on 17 December 2021.

Snowy Hydro proposes a modification to the project to allow each gas turbine to operate for up to 1,100 cumulative hours on diesel fuel in calendar year 2025 (the 'proposed modification'). The project is declared to be (critical) State significant infrastructure, and therefore the proposed modification requires assessment and approval under Part 5 (Division 5.2) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This report:

- Describes the proposed modification and how it differs from the approved project
- Identifies and assesses the environmental impacts of the proposed modification, where they are likely to differ from the impacts assessed in the Hunter Power Project environmental impact statement (EIS)
- Provides a justification for the proposed modification.

The report has bene prepared generally in accordance with the *State Significant Infrastructure Guidelines – Preparing a Modification Report* (Department of Planning and Environment, 2022).

1.1 Background and need for the proposed modification

The power station's gas turbines are designed to operate on either natural gas or diesel fuel. Natural gas will be supplied to the power station by a new 20.1-kilometre lateral pipeline that connects the Sydney-Newcastle Pipeline to the Hunter Power Project site. The lateral pipeline is known as the Kurri Kurri Lateral Pipeline Project and was the subject of a separate planning approval to the Hunter Power Project. APA Group (APA) is the proponent of the Kurri Kurri Lateral Pipeline Project and is responsible for its construction and operation.

Construction of the pipeline has experienced delays due to a combination of factors that include the time taken for APA to be granted a pipeline licence under the *Pipelines Act 1967*, and construction delays caused by wet weather, hot weather and industrial action. The delays to construction of the pipeline will result in the power station being ready to start commissioning before gas can be supplied to the plant. Under the current program, commissioning of the power station is expected to commence in late 2024, but construction of the gas pipeline is not expected to be completed until late 2025.

Diesel fuel will be delivered to the power station in B-double tankers using the existing road network. Diesel fuel will be stored at the power station in two 2.1-megalitre diesel fuel storage tanks. Diesel fuel will be available to power the turbines prior to commencement of commissioning as soon as construction of the power station. The opportunity therefore exists to operate the gas turbines using diesel fuel until the gas pipeline is completed.

Conditions A8 and A9 of the approval for the project place the following limits on the operation of the gas turbines:

- *A8 — Fuel burning equipment must not be operated for the purpose of generating electrical power at the premises for more than 1,100 cumulative hours per calendar year*
- *A9 — Fuel burning equipment must not be fired on diesel for the purpose of generating electrical power at the premises for more than 175 cumulative hours per calendar year.*

Condition A9 would severely limit the opportunity for the power station to operate in 2025 using diesel fuel to fire the gas turbines until the pipeline is completed. Accordingly, Snowy Hydro proposes a modification to the project to provide temporary relief from Condition A9 to allow each gas turbine to operate for up to 1,100 cumulative hours on diesel fuel in calendar year 2025.

1.2 Alternatives

The main alternative to the proposed modification is that the project operates in accordance with condition of approval A9 during 2025. In the event that construction of the gas pipeline is completed at the very end of 2025, this would mean that the power station would be restricted to 175 cumulative hours of operation of each gas turbine. This would result in the electricity market operating sub-optimally relative to the available generating capacity if there are more instances when it is favourable to operate peak load generation facilities than the project is permitted to operate.

1.2.1 Environmental assessment requirements

A meeting was held with the NSW Department of Planning, Housing and Infrastructure (DPHI) on 26 July 2024 to discuss the proposed modification and the requirements for its environmental assessment. This was formalised in a scoping request letter dated 31 July 2024. DPHI has reviewed the approach outlined in the letter and notified Snowy Hydro that the proposal can be assessed as a modification to the existing approval under Section 5.25 of the EP&A Act. DPHI required that Snowy Hydro consult with the relevant agencies and stakeholders, including the NSW Environment Protection Authority (EPA) to confirm that the proposed modification meets relevant policies and guidelines, particularly in relation to noise, air quality and greenhouse gas emissions. DPHI also required that the modification report be prepared having regard to the *State Significant Infrastructure Guidelines – Preparing a Modification Report* (Department of Planning and Environment, 2022) and that it effectively addresses the following matters:

- Consultation — Details about the government agency and other relevant stakeholder consultation undertaken having regard to DPHI's (2024) *Undertaking Engagement Guidelines for State Significant Developments* (refer to **Section 5**).
- Justification — Robust information justifying the proposed modification, having regard to the Australian Energy Market Operator's current reports and forecast relating to electricity and energy security and demand in NSW, and assessment of alternatives, including not progressing with the proposed modification (refer to **Section 7**).
- Greenhouse gas — An updated quantitative analysis and confirmation that the conditions of the approved project would be met based on contemporary policies, guidelines and criteria. In particular, the assessment must have regard to the EPA's recently released Draft *Greenhouse Gas Assessment Guideline for Large Emitters*, which can apply to modification application. Snowy Hydro should consult with the EPA regarding this matter (refer to **Section 6.2**).
- Noise and traffic — Quantitative assessment of road traffic noise for the additional truck movements (refer to **Sections 6.3** and **6.4**).
- Water supply and wastewater — Quantitative assessment of the water balance for the project and management of wastewater (refer to **Sections 6.5** and **6.6**).
- Other impacts – Qualitative assessment of other impacts based on the contemporary policies, guidelines/criteria (e.g. other air emissions, traffic and hazards) (refer to **Section 6.7**).

The proposed modification will not change any aspect of the project's operation from 2026 onwards, and has not been conceived or proposed in response to any change in the overall strategic context or need for the project. With the exception of the fuel used to fire the gas turbines in 2025, all aspects of the project's operation including the project objectives, will remain unchanged from what was described and assessed in the Hunter Power Project EIS. There has been no change to the underlying need or justification for the project since the publication and approval of the Hunter Power Project EIS.

The objective of the proposed modification is to facilitate the commencement of operation of the Hunter Power Project as soon as practicable, and not to wait until construction of the Kurri Kurri Lateral Pipeline

Project is also complete. This will enable the Hunter Power Project to deliver the electricity network benefits of a peak load generation facility, which include:

- Improving the efficiency and reliability of the electricity network as existing generation assets are retired
- Facilitating the transition to renewable energy generation by providing peak generating capacity at times when high demand coincides with reduced renewable energy generating capacity
- Applying downward pressure on energy prices during peak periods, to the benefit of households, businesses and industry.

2. Strategic context

The strategic context for the project was described in section 4 of the EIS and remains unchanged. As detailed in the EIS, the closure of the Liddell power station and resulting withdrawal of baseload generating capacity increases reliance on renewable power generation. In order to provide a reliable supply of energy, intermittent energy such as wind and solar needs to be firmed. Open cycle gas fired generation capacity can provide firming of renewable generation projects' intermittent electricity supply to the national energy market.

The project will provide dispatchable capacity and other network services that can be used by the Australian Energy Market Operator to meet the requirements of the national energy market, and to supplement Snowy Hydro's generation portfolio with dispatchable capacity when the needs of electricity consumers are highest. The project is aligned with the following strategic policy:

- The project will help to achieve the aims of the Australian Government's energy policy 'A Fair Deal on Energy' to put downward pressure on electricity and gas prices, encourage new reliable supply and technology, and invest in new ways to make the energy system cleaner and more efficient.
- The project will assist in maintaining the supply-demand balance of electricity sought by the Australian Energy Market Operator as well as contribute to achieving their reliability indices (the reliability standard and interim reliability measure). The project is also aligned with the Australian Energy Market Operator's Integrated System Plan that aims to maximise value to end consumers during the transition to higher dependence on renewable energy.
- The project is aligned with the NSW Government's electricity strategy, 'Affordable, reliable power for NSW' as it builds essential efficiency and reliability into the network, which will be needed during the transition period as existing assets are retired. The project is also aligned with the NSW Government's NSW Electricity Infrastructure Roadmap, which recognises that investment in large-scale storage and firming capacity is needed to balance the supply of variable renewable energy.
- At a regional and local level, the project contributes to the goal of the Hunter Regional Plan 2036 to diversify energy supply, and the objectives of the Cessnock Community Strategic Plan 2027 to create new jobs, diversify the economy and support business growth.

3. Description of the proposed modification

3.1 Overview

A summary comparison of the differences between the approved project and the proposed modification is provided in **Table 3.1**.

Table 3.1 Summary comparison: approved project and proposed modification

Project element	Summary of the approved project	Summary of the proposed modification
Air quality impacts	Modelling showed that operation of the power station, whether fuelled by natural gas or diesel, would not cause adverse air quality impacts	The air quality modelling results also apply to the proposed modification. The inclusion of recent local background air quality conditions and current and more stringent impact assessment criteria found that air emissions from the project would remain below current impact assessment criteria
Greenhouse gas emissions	314,423 tCO_2e in year 1	565,214 tCO_2e in year 1 (2025)
Noise emissions	Modelling shows that operation of the power station would comply with the operational noise criteria at all sensitive receptors at all times	The operational noise modelling results also apply to the proposed modification
Traffic	Up to 12 B-double tanker movements per day between 8:00 am and 4:00 pm	Up to 24 B-double tanker movements per day between 6:00 am and 6:00 pm in 2025
Water consumption	Demand for up to 80 megalitres of water per annum	Demand for up to 235 megalitres of water in 2025
Waste	Up to 16.2 megalitres of wastewater produced per annum	Up to 34 megalitres of wastewater produced in 2025

3.1.1 Proposed changes to the project description

The project was described in section 2 of the EIS and some the description would change as a result of the proposed modification. Table 3.2 identifies the element of the project description that would change as a result of the proposed modification. Complete text of the updated sections of the EIS project description are provided in **Appendix A**.

Sections 3.2 to **3.9** below provide more detail on how the proposed modification compares to the approved project.

Table 3.2 Changes to the project description as a result of the proposed modification

EIS reference	Summary of the approved project description	Summary of the proposed modification
Table 2.1, Proposed commencement of operation	Approximately August to December 2023	Early 2025
Section 2.5.1 Proposal operation - General	It is possible that the gas connection infrastructure (new gas lateral pipeline and gas receiving station; being developed by others) may not be completed until	It is possible that the gas connection infrastructure (new gas lateral pipeline and gas receiving station; being developed by others) may not be completed until

EIS reference	Summary of the approved project description	Summary of the proposed modification
	approximately six months after the Proposal's commissioning. Thus, if the Proposal needed to operate within the first scheduled six months of operation, beginning approximately August 2023, it would need to operate on diesel depending on the timing for completion of construction of the gas lateral pipeline.	approximately twelve months after the Proposal's commissioning. Thus, if the Proposal needed to operate within the first scheduled twelve months of operation, beginning approximately January 2025, it would need to operate on diesel depending on the timing for completion of construction of the gas lateral pipeline.
Section 2.5.3 Operational traffic	For the purposes of this EIS, it is assumed that diesel fuel delivery occurs with a maximum of six tankers per day (12 movements total), until the tanks are refilled.	For the purposes of this EIS, it is assumed that diesel fuel delivery occurs with a maximum of six tankers per day (12 movements total), until the tanks are refilled, except in 2025, when there would be a maximum of twelve tankers per day (24 movements total) during and for up to a week after each time that the gas turbines are operated on diesel fuel. In 2025, there would be a small increase in truck movements associated with additional water treatment chemicals and the additional waste generated by the power station when it operates on diesel fuel compared to natural gas.
Section 2.5.3 Operational traffic, Table 2.4 Preliminary operational traffic volumes and timing	Event: Diesel fuel refilling Vehicle type: B double (3 axle) Maximum vehicle movements per day: 12 Typical arrival / departure: 8:00 am to 4:00 pm Timing: Daily during or post operation of the gas turbines on diesel, up to three times per year	Event: Diesel fuel refilling, from 1 January 2026 Vehicle type: B double (3 axle) Maximum vehicle movements per day: 12 Typical arrival / departure: 8:00 am to 4:00 pm Timing: Daily during or post operation of the gas turbines on diesel, up to three times per year (new row) Event: Diesel fuel refilling, 2025 Vehicle type: B double (3 axle) Maximum vehicle movements per day: 24 Typical arrival / departure: 6:00 am to 6:00 pm Timing: Daily during or post operation of the gas turbines on diesel
Section 2.5.6 Water consumption	The maximum estimated annual water consumption based on a 10 per cent capacity factor for gas and two per cent capacity factor for diesel fuel in any given year is estimated to be approximately 80 ML per annum. This will again be dependent on the eventual gas turbine selected for the Proposal and would be refined during the detailed design process.	The maximum estimated annual water consumption based on a 10 per cent capacity factor for gas and two per cent capacity factor for diesel fuel in any given year is estimated to be approximately 80 ML per annum. This will again be dependent on the eventual gas turbine selected for the Proposal and would be refined during the detailed design process. Consumption of up to about 235 megalitres of water could occur in

EIS reference	Summary of the approved project description	Summary of the proposed modification
		2025 if the turbines operate on diesel fuel throughout the entire year.

3.1.2 Proposed changes to the infrastructure approval

The proposed modification is to delay the implementation of condition of approval A9 until 2026. The following rewording of condition of approval A9 is proposed (rewording shown in red font):

> *A9. Commencing 1 January 2026, fuel burning equipment must not be fired on diesel for the purpose of generating electrical power at the premises for more than 175 cumulative hours per calendar year.*

This change would have the effect of allowing each gas turbine to operate for up to 1,100 hours on diesel fuel in 2025, in accordance with condition of approval A8.

3.2 Capacity to operate on diesel fuel

The approved power station is a dual fuel facility, with the gas turbines able to be fired using either natural gas or diesel fuel. As stated in sections 1.1 and 2.2 of the EIS, the gas turbines would primarily be fired on natural gas with the use of diesel as a back-up fuel in the event that gas supply to the power station is not available for any reason.

The plant's diesel fuel system was described in section 2.2.3 of the EIS. It was described as comprising two diesel fuel storage tanks of approximately 1.75 megalitres volume (subject to detailed design and eventual gas turbine selected). As noted in **Section 1.1**, two tanks each of 2.1 megalitres capacity (i.e. 4.2 megalitres total capacity) have been constructed.

In summary, firing of the gas turbines using diesel fuel already forms part of the approved project.

3.3 Availability of natural gas at commencement of operation

Section 2.5.1 of the EIS identified the potential for natural gas to be unavailable when commissioning of the power station commenced, stating that:

> *It is possible that the gas connection infrastructure (new gas lateral pipeline and gas receiving station; being developed by others) may not be completed until approximately six months after the Proposal's commissioning. Thus, if the Proposal needed to operate within the first scheduled six months of operation, beginning approximately August 2023, it would need to operate on diesel depending on the timing for completion of construction of the gas lateral pipeline.*

The situation foreshadowed in the EIS is now expected to occur, with the only differences being that the power station is currently scheduled to start operation in early 2025, and natural gas supply to the plant may not occur until the end of 2025.

In summary, the EIS identified the potential for the gas turbines to initially be operated on diesel fuel until construction of the gas pipeline is completed.

3.4 Air quality modelling of diesel-only operation

Section 15.1.1 of the EIS identified that when the power station commences operation the air emissions may initially be a result of the gas turbines operating on diesel fuel:

> *The power station will be fuelled by natural gas normally, with diesel used as a backup fuel. This might include up to six months of diesel-only operation during 2023 before the natural gas supply to the Proposal Site is completed. The power output by the power station and air pollutant emissions profile will be different for each fuel type.*

The proposed modification is aligned with the air emissions scenario foreshadowed in the EIS, with the only differences being that the air emissions from diesel-only operation would now occur in 2025 and would be for up to 12 months.

Further discussion of the air quality impacts of the project when the gas turbines are fired by diesel fuel is provided in **Section 6.1**.

3.5 Greenhouse gas emissions in year 1

Operational greenhouse gas emissions were assessed in section 15.4.3 of the EIS. Greenhouse gas emissions in the first year of operation of the power station were estimated in Table 15.11 of the EIS and were based on:

- Six months of diesel-only operation during which each turbine would operate for a cumulative 100 hours
- And then six months of operation on natural gas with diesel fuel as a back-up during which each turbine would operate for 438 cumulative hours on natural gas and 87.5 cumulative hours on diesel fuel.

The EIS therefore calculated greenhouse gas emissions during the first year of operation based on each gas turbine operating for 438 cumulative hours on natural gas and 187.5 hours on diesel fuel.

Under the proposed modification, each gas turbine would operate on diesel for up to the approved 1,100 cumulative hours in 2025, hence the greenhouse gas emissions for the first year of operation of the power station need to be recalculated. A revised estimate of greenhouse gas emissions in the first year of operation is provided in **Section 6.2**.

3.6 Noise emissions during diesel-only operation

Noise emission sources during operation of the project are described in section 5.2.1 of the revised noise impact assessment report (Appendix G of the response to submissions report). All of the identified operational noise sources listed in Tables 5.2 and 5.3 of the report were included in the operational noise modelling. The modelling therefore covers operation of the gas turbines on natural gas or diesel fuel. The operational noise impacts described in section 6.4 of the revised noise impact assessment report cover both these scenarios and accordingly these also apply to the proposed modification. As the noise emissions resulting from the power station operating with the gas turbines being fired by diesel fuel have already been modelled, no further noise modelling is warranted.

The noise sources considered in the noise impact assessment report, the project noise trigger levels established for the project and the effect of the design changes that have occurred during the detailed design phase of the project are discussed in **Section 6.3**.

3.7 Traffic generated by diesel-only operation

Section17.3.2 of the EIS identifies three instances when the project would generate additional operational traffic and one of these is diesel fuel delivery. The EIS notes that:

> *B-double road tankers would be used to refill the onsite diesel storage tanks if and when they are used. The refilling of the storage tanks is dependent on the frequency and duration that the power station is run on diesel and is highly variable but could be expected to occur up to three times annually.*

The power station is designed for only one tanker to be engaged in diesel fuel transfers at a time. The transfer of the 42-kilolitre capacity of a tanker will take about one hour including the time required to connect and disconnect to the transfer pumping system.

The EIS estimated the maximum number of daily tanker trips that would be generated during filling (or emptying) of the diesel fuel storage tanks based on a tanker of 50-kilolitre capacity. Section 17.3.2 of the EIS states that:

> *Approximately 12 heavy vehicle (B double) movements (i.e. six inbound trips and six outbound trips) is expected when diesel fuel replacement is required and these would occur between the hours of approximately 8:00 am to 4:00 pm.*

The expected maximum number of daily tanker movements required to refill the diesel fuel storage tanks has been reviewed for the proposed operation of the gas turbines on diesel fuel only during 2025. The maximum of 12 tanker movements per day identified in the EIS would be insufficient to maintain on-site diesel fuel storage at the level required to operate the gas turbines at the higher end of the operating hours permitted by condition of approval A8. It is proposed to modify the project description to include up to 24 tanker movements (12 inbound trips and 12 outbound trips) per day so that tanker movements do not become a constraint on the ability to operate the plant.

In additional to a higher maximum number of tanker movements to and from the power station each day, the proposed modification would also result in more days when the maximum number of tanker movements occur. Instead of the maximum number of daily tanker movements only occurring three times per year as stated in Tables 2.4 and 17.4 of the EIS, it would instead occur during and for up to a week after each time that the gas turbines are operated on diesel fuel.

Additionally, there would be a small increase in truck movements associated with additional water treatment chemicals and the additional waste generated by the power station when it operates on diesel fuel compared to natural gas (refer to **Section 3.9**).

An assessment of the additional operational traffic that would be generated as a result of the proposed modification is provided in **Section 6.4**.

3.8 Water consumption in year 1

Key water demands during operation of the power station are identified in a water balance provided in section 14.3.2 of the EIS. Operational water demand varies depending on the type of fuel used, with operation on natural gas having a significantly lower water consumption than operation on diesel fuel. Estimated water demand (kilolitres per hour) is provided in Tables 14.5 and 14.6 for the gas turbines being operated on natural gas and diesel fuel respectively. The EIS provided an indicative total annual water demand of about 80 megalitres based on both gas turbines each operating for 876 hours on natural gas and 175 hours on diesel fuel. The EIS did not provide a separate estimate for water consumption during the first year of operation.

Given that the power station consumes more water when the gas turbines are operating on diesel fuel compared to natural gas, the proposed modification would result in greater water consumption during the first year of operation compared to any alternative scenario that involves the same number of operating hours and uses natural gas for some of those operating hours.

The EIS also estimated total annual operational wastewater volume of 16.2 megalitres, again based on both gas turbines each operating for 876 hours on natural gas and 175 hours on diesel fuel. The EIS did not provide a separate estimate for the volume of wastewater generated during the first year of operation.

The proposed modification would result in consumption of up to about 235 megalitres of water in 2025 if the turbines operate on diesel fuel throughout the entire year. The impact of this potential additional water consumption is assessed in **Section 6.5**.

3.9 Waste generated in year 1

The power station includes a demineralisation plant that will provide demineralised water for water injection when operating the plant on diesel fuel for NO_x emission control.

Section 2.2.10 of the EIS identified that demineralised water would also be used for wet compression/fogging to cool the air to improve the gas turbine performance (when operating on either gas or diesel) mainly during high ambient temperature conditions or when additional power augmentation is required. However, the need for wet compression was designed out during the detailed design phase of the project.

The liquid waste generated by the demineralisation plant will be managed as trade waste subject to a trade waste agreement between Snowy Hydro Limited and Hunter Water, to be executed before the power station commences operation (refer to sections 2.2.10 and 20.3.2 of the EIS).

The project's wastewater disposal needs (trade waste and municipal sewage) would be met through connection into existing Hunter Water infrastructure. Trade waste discharge from the project site will consist mainly of demineralised water plant regeneration wastewater, water discharged from the gas turbine evaporative coolers and discharge from some oily water separators. Trade waste will be discharged to the sewer in accordance with Hunter Water trade waste requirements.

An indicative total annual wastewater volume for operation of the project of approximately 16.2 megalitres was provided in section 14.3.2 of the EIS based on the gas turbines operating for 876 hours on natural gas and 175 hours on diesel fuel.

The proposed modification would result in up to 34 megalitres of wastewater being produced in 2025. The impact of this additional wastewater is assessed in **Section 6.6**.

4. Statutory context

This section describes the statutory and legislative provisions applying in respect of the proposed modification, and in particular those provisions guiding the statutory approval required to modify the project.

4.1 Commonwealth legislation

4.1.1 Environment Protection and Biodiversity Conservation Act, 1999

The project was referred to the Commonwealth Minister for the Environment on 25 February 2021. The project was subsequently declared to be a controlled action under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC Reference: 2021/8888) because of its likely impacts on the environment in relation to air quality during operation; and in relation to potential disturbance and mobilisation (to surface or groundwater) of contaminated soils or acid sulphate soils.

The project was assessed under the *Bilateral Agreement made under section 45 of the Environment Protection and Biodiversity Conservation Act 1999 relating to environmental assessment*, made in February 2015 between the Commonwealth and the State of NSW (the Bilateral Agreement). An approval under the EPBC Act was granted by the Commonwealth Environment Minister on 6 February 2022.

Conditions 14 and 15 of the EPBC approval state, respectively:

14. The approval holder must notify the Department in writing of any proposed change to the State development consent that may relate to environment within 2 business days of formally proposing a change or within 5 business days of becoming aware of any proposed change.

15. The approval holder must notify the Department in writing of any change to the State development consent conditions that may relate to environment, within 10 business days of a change to the conditions being finalised.

The EPBC Act does not make provision for a ministerial approval of a controlled action to be modified or amended. Snowy Hydro is therefore bound by conditions 14 and 15 of the controlled action approval to notify the Commonwealth Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW) of any proposed change to the NSW Minister's approval, and/or of any change to the NSW Minister's conditions of approval, where those changes relate to the environment.

The proposed modification would impact on emissions to air during the first year of operation of the power station as discussed in **Section 5.1.** Therefore, in accordance with controlled action condition 14, Snowy Hydro notified the Commonwealth DCCEEW on 13 August 2024 of the proposed modification and the intention to seek a change to the State development consent.

4.2 NSW legislation

4.2.1 Environmental Planning and Assessment Act 1979

Project approval

The project was declared by the NSW Minister for Planning and Public Spaces to be critical State significant infrastructure under section 5.13 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 16 December 2020. As such, the project is considered to be 'essential for the State for economic, environmental or social reasons', and is listed under section 2.15 and Schedule 5 of State Environmental Planning Policy (Planning Systems) 2021.

The project was approved (as SSI-12590060) by the Minister on 17 December 2021.

Proposed modification

Under section 5.25 of the EP&A Act, a proponent may request the NSW Minister for Planning and Public Spaces to modify an approval for State significant infrastructure. Such approval is required if the infrastructure as modified is not consistent with the existing approval issued under section 5.13 of the Act.

Snowy Hydro considers that the proposed change to the project described in **Section 3** is not consistent with the Minister's approval under section 5.13 of the EP&A Act and has consulted the Department of Planning, Housing and Infrastructure (DPHI) about the proposed change. Snowy Hydro met with DPHI on 26 July 2024 to discuss the proposed modification and then issued DPHI a scoping request letter on 31 July 2024 summarising the proposed modification and its likely impacts and the assessment it proposed to carry out of these impacts. In a letter to Snowy Hydro dated 5 August 2024, DPHI confirmed that the proposal can be assessed as a modification under section 5.25 of the EP&A Act and identified several matters that must be addressed in this modification report.

The Minister may modify the approval with or without changes to the current conditions of approval.

5. Engagement

Snowy Hydro has engaged with the NSW Environment Protection Authority and Cessnock City Council during preparation of this modification report. These engagements are described in the following sections.

5.1 NSW Environment Protection Authority

Snowy Hydro met with the EPA on 19 August 2024 to discuss the proposed modification and particularly how potential impacts to air quality and greenhouse gas emissions would be assessed. The EPA required that the assessment of air quality impacts include:

- The impact assessment criteria in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW Environment Protection Authority, 2022);
- The 2015 Variation to the National Environment Protection (Ambient Air Quality) Measure; and
- Any existing sensitive receptors not included in the EIS assessment.

The assessment of the air quality impacts of the proposed modification has addressed the EPA's requirements (refer to **Section 6.1**).

5.2 Cessnock City Council

Snowy Hydro provided details of the proposed modification to Cessnock City Council in a letter dated 21 August 2024. The letter summarised the information provided in this modification report. Snowy Hydro invited comment on the proposed modification from council. On 23 August 2024 council indicated that it had no comments on the proposal.

5.3 Commonwealth DCCEEW

As described in **Section 4.1.1**, the proposed modification would impact on emissions to air during the first year of operation of the power station as discussed in **Section 5.1.** Therefore, in accordance with controlled action condition 14, Snowy Hydro notified the Commonwealth DCCEEW on 13 August 2024 of the proposed modification and the intention to seek a change to the State development consent.

6. Assessment of impacts

6.1 Air quality

The potential air quality impacts of the project were assessed in an updated air quality impact assessment report prepared in August 2022. The assessment was completed to satisfy condition of approval B5, which required an updated air quality assessment report based on the final design of the power station. The assessment updated the revised air quality impact assessment report that formed Appendix F of the response to submissions report. The final design affected the air quality impact assessment as follows:

- Mitsubishi Heavy Industries was selected as the main equipment supplier, which meant their product-specific emissions data could be used rather than blended data from a range of potential equipment manufacturers
- The height of the exhaust stacks was increased to 60 metres in order to comply with the noise criteria specified in the conditions of approval and Environment Protection Licence 21627
- The capacity of the power station was reduced to 660 megawatts due to limitations of the 132 kilovolt transmission network.

The updated assessment included air quality modelling that showed that the final design would result in a reduction in air quality impacts compared to the approved project.

A Level 2 air quality impact assessment was carried out for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$), carbon monoxide (CO) and the volatile organic compounds: formaldehyde, acrolein and polycyclic aromatic hydrocarbons as benzo(a)pyrene using contemporaneous measurements and model data in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW Environment Protection Authority, 2016). Calpuff dispersion modelling was carried out for the worst-case scenario of both gas turbines being operated concurrently at maximum (100 per cent) loading and running on either natural gas or diesel fuel. This assessment modelled continuous emissions from the power station to assess the impact of its operation for every hour of an annual meteorological simulation.

The model applied a three-dimensional grid to a 30-kilometre by 20-kilometre horizontal area approximately centred on the power station site, with nine vertical layers between ground level and two kilometres above ground level. The horizontal lines of the grid were spaced 250 metres apart, to form 9,600 grid receptors (120 x 80). At each grid receptor the maximum total concentrations of each assessed air pollutant were modelled for every hour of the simulation. The model was also used to assess impacts at 16 sensitive receptors, which were identified from satellite imagery as locations where people are likely to live or work and which could potentially be the receptors most impacted by air emissions from the project.

The modelling predicted that the project would meet ambient air quality impact assessment criteria set out in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW Environment Protection Authority, 2016) (the '2016 Approved Methods') for ground level concentrations for air pollutants CO, NO_2, SO_2, $PM_{2.5}$, and the volatile organic compounds: formaldehyde, acrolein and polycyclic aromatic hydrocarbons as benzo(a)pyrene.

The key outcomes of the air quality assessment were:

- The project will meet the requirements of the Protection of the Environment Operations (Clean Air) Regulation 2010 for air pollutant concentrations in the exhaust gases
- Operation of the project will lead to small increases of ambient (ground level) concentrations of the air pollutants: CO, NO_2, SO_2, $PM_{2.5}$ and the volatile organic compounds: formaldehyde, acrolein and polycyclic aromatic hydrocarbons (as benzo(a)pyrene); these small increases are predicted to not cause significant air quality impacts, by comparisons with the 2016 Approved Methods impact assessment criteria
- The predicted changes in concentrations of key air quality indicators due to the project are within the range of historically measured fluctuations in maximum concentrations for the region

- The air pollutants of concern are those where background levels are already high i.e. NO_2 (because ozone (O_3) levels are high) and $PM_{2.5}$. However, modelling showed that the project would not cause additional exceedances of criteria.

Based on the modelling, increases in NO_2 concentrations due to the project are unlikely to cause exceedances of NO_2 criteria. However, O_3 background levels are high, and any additional NO_x emissions represent an increase to regional NO_x that contribute to the formation of O_3 in the wider region. It was assumed that the power station NO_x emissions would have the effect of slightly reducing O_3 levels in its immediate vicinity (O_3 destruction) but contribute to a very slight increase in regional O_3 levels.

The modelling showed that the project would make a negligible contribution to $PM_{2.5}$ relative to the air quality criteria. Concentrations of $PM_{2.5}$, including with potential contributions from the project, would continue to be within the range of historically measured fluctuations in maximum concentrations for the region. This means that in a year when the Hunter Valley is not affected by bushfires, emissions from the project are very unlikely to cause exceedances of the $PM_{2.5}$ criteria. In a year affected by bushfires, measurements of $PM_{2.5}$ in the Hunter Valley will reflect the influence of bushfire smoke.

The assessment demonstrated that operation of the power station, whether fuelled by natural gas or diesel, would not cause adverse air quality impacts either locally or in the wider Lower Hunter region.

6.1.1 Review of the air quality modelling

The updated air quality modelling carried out for the final design assessed a scenario of both gas turbines operating on diesel fuel at maximum loading continuously for every hour of a meteorological year. Therefore, the air quality impacts of the project operating with the gas turbines being fired by diesel fuel have already been modelled. As discussed with the EPA (refer to **Section 4.1**), a review of the assessment is warranted because since the updated air quality modelling was completed in 2022 some impact assessment criteria have been lowered (i.e. become more stringent), and there is potential for additional sensitive receptors. The EPA's impact assessment criteria for carbon monoxide (CO), NO_2, SO_2 and $PM_{2.5}$ relate to the total concentration of the pollutant in the air (that is, cumulative) and not just the contribution from project-specific sources. Therefore, background levels also need to be considered when using these criteria to assess the potential impacts.

A review of the regulatory changes and background levels is provided below, together with a review of sensitive receptors.

Review of background air quality

The EPA's impact assessment criteria for CO, NO_2, SO_2 and $PM_{2.5}$ relate to the total concentration of the pollutant in the air (that is, cumulative) and not just the contribution from project-specific sources. Therefore, background levels are an important consideration when using these criteria to assess potential impacts.

All versions of the air quality impact assessment of the project to date have used background data collected from 2015 to 2019 at monitoring stations operated by DPHI in locations surrounding the project site. For the proposed modification more recent data collected at these stations was reviewed to identify whether there have been any material changes in background air quality since 2019. Data from 2015 to 2023 (last published year) is provided in **Table 6.1**.

Table 6.1 Background air quality data, 2015 to 2023

Percentile and averaging period	2015	2016	2017	2018	2019	2020	2021	2022	2023
CO (mg/m^3), measured at DPHI Newcastle station									
Max, 1-hour	2.0	2.4	1.6	1.4	2.2	3.7	1.5	1.3	1.3
Max, 8-hour	1.7	1.6	1.3	1.2	1.7	3.0	1.0	1.0	1.0
SO_2 (µg/m^3), measured at DPHI Beresfield station									
Max, 1-hour	215	86	141	183	178	100	71	63	73
Max, 8-hour	21	21	21	18	24	21	13	16	16
Annual	2.6	2.6	5.2	5.2	5.2	2.6	2.6	2.6	2.6
NO_2 (µg/m^3), measured at DPHI Beresfield station									
Max, 1-hour	92	77	75	75	105	66	64	55	71
Annual	17	15	16	17	15	13	13	11	17
O_3 (µg/m^3), measured at DPHI Beresfield station									
Max, 1-hour	151	167	163	210	247	182	131	127	153
Max, 4-hour	131	133	155	175	210	149	120	112	141
$PM_{2.5}$ (µg/m^3), measured at DPHI Beresfield station									
Max, 24-hour	26	28	19	25	101	50	19	12	17
Number of days above criterion	1	1	0	0	23	8	0	0	0
Annual	7.4	7.4	7.6	8.7	12.2	7.7	5.9	5.0	6.7

Source: DPHI (2024)

As **Table 6.1** shows, background air quality between 2020 and 2023 has improved compared to the 2015 to 2019 data reviewed as part of the previous assessment:

- CO: 2020 to 2023 maximum 1-hour and 8-hour averaged concentrations of CO were generally at or below the concentrations measured from 2015 to 2019. Maximum 1-hour averaged concentrations in 2022 and 2023 (1.3 mg/m^3) were below the 1.4 mg/m^3 background concentration adopted in the previous assessment. 2022 and 2023 maximum 8-hour rolling concentrations (1.0 mg/m^3) were also equivalent to the 1.0 mg/m^3 value used in the previous assessment
- SO_2: Maximum 1-hour and 24-hour, as well as annually averaged concentrations of SO_2 measured from 2020 to 2023 were similarly at or below the concentrations measured from 2015 to 2019. Maximum1-hour and 24-hour averaged background concentrations of 183 µg/m^3 and 19 µg/m^3 were adopted in the previous assessment. Maximum1-hour and 24-hour averaged background concentrations for 2020 to 2023 were all below these values
- NO_2: Maximum 1-hour and annually averaged NO_2 concentrations from 2020 to 2023 were also at or below the concentrations measured from 2015 to 2019. Understanding that contemporaneous background data using the Ozone Limiting Method was applied, the maximum 1-hour background concentration modelled was 75 µg/m^3. The maximum 1-hour averaged concentrations in 2022 and 2023 were lower, being 55 µg/m^3 and 71 µg/m^3 respectively. For annually averaged NO_2, the previous assessment adopted a background concentration of 16 µg/m^3. In 2022, the measured annual NO_2 at Beresfield was 11 µg/m^3, and in 2023 it was 17 µg/m^3
- O_3: 2020 to 2023 maximum 1-hour and 4-hour concentration of O_3 were also generally at or below those collected from 2015 to 2019
- $PM_{2.5}$: 2019 and 2020 $PM_{2.5}$ results were affected by the unprecedented bushfire season across Eastern Australia. The previous assessment considered maximum 24-hour and annually averaged background

values of 25 µg/m^3 and 8.7 µg/m^3 respectively, as measured at the Beresfield station in 2018. The maximum 24-hour and annually averaged concentrations of $PM_{2.5}$ recorded in 2023 were lower, at 17 µg/m^3 and 6.7 µg/m^3 respectively.

Background concentrations of VOCs were estimated in the previous assessment using historical data from various studies. These data, and the outcomes of the previous assessment remain applicable.

Changes to regulatory requirements

Impact assessment criteria

As discussed above, the updated air quality modelling assessed the impacts of the project against the criteria set out in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW Environment Protection Authority, 2016). The EPA updated the Approved Method in 2022 (the '2022 Approved Methods'), with the update applying to planning applications submitted after 9 September 2022. The 2022 update incorporates more stringent regulation for O_3, SO_2 and NO_2 introduced by the 2021 Variation to the National Environment Protection (Ambient Air Quality) Measure, which was approved on 15 April 2021. The criteria for SO_2 and NO_2 from the 2016 Approved Methods adopted in the previous assessment based on the 2016 Approved Methods and the current criteria from the 2022 Approved Methods are summarised in **Table 6.2**. It shows how the impact assessment criteria for SO_2 and NO_2 have reduced, consistent with current scientific understanding of concentrations that can lead to adverse impacts. It is also noted that the maximum 10-minute and annually averaged impact assessment criteria for SO_2 were removed in the 2022 update.

Table 6.2 Comparison of SO_2 and NO_2 impact assessment criteria from the 2016 and 2022 Approved Methods

Pollutant	Percentile and averaging time	Impact assessment criteria	
		2016 Approved Methods	2022 Approved Methods
SO_2	Max, 10-minute	712	Removed
	Max, 1-hour	570	286*
	Max, 24-hour	228	57
	Annual	60	Removed
NO_2	Max, 1-hour	246	164
	Annual	62	31

Notes
* Decreases to 215 µg/m3 for impact assessments prepared after 1 January 2025

NEPM advisory goals

The NEPM sets goals for national ambient air quality but doesn't define any specific limits for the purpose of impact assessment. These goals do not become criteria for air quality impact assessment purposes until they are adopted by the relevant state environmental authorities.

'Goals for particles as $PM_{2.5}$' were introduced by the 2015 Variation to the National Environment Protection (Ambient Air Quality) Measure (NEPM). The goals for $PM_{2.5}$ are:

- Max, 24 hours – 20 µg/m^3
- Annual – 7 µg/m^3.

Although the 'goals for particles as $PM_{2.5}$' are not included in the 2022 Approved Methods, they have been included as criteria for the assessment of the proposed modification.

Sensitive receptors

Sensitive receptors are defined in both the 2016 and 2022 Approved Methods as 'a location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area'. Section 4.2 of the updated air quality impact assessment report identified 16 potential sensitive receptor locations, mainly isolated residences, that were considered to be representative of locations potentially experiencing worst-case air quality impacts due to the project because they were nearest to the project site. Current (August 2024) satellite imagery of the project site and surrounds has been reviewed to check whether these 16 receptors remain representative of locations potentially experiencing worst-case air quality impacts due to the project. The results of the review are shown in **Table 6.3**. The review found that the 16 locations remain representative of the locations potentially experiencing worst-case air quality impacts due to the project, and that there are no new sensitive receptors that are closer to the project site that these 16 representative locations (and which could therefore be at risk of worse air quality impacts than what has been assessed).

Table 6.3 Review of the 16 sensitive receptors used in the updated (August 2022) air quality impact assessment

Sensitive receptor ID #	Eastings	Northings	Latitude and longitude	Description	Address	Lot and DP	MetroMap Aug 2024 satellite image review
1	358086	6370341	32.795732483° S 151.484392263° E	Residence	6 Dawes Avenue, Loxford	Lot 1 DP 502196	No change – remains a suitable representative location for the two isolated dwellings on Dawes Avenue
2	357748	6369983	32.798917012° S 151.480728688° E	Residence	14 Horton Road, Loxford	Lot 1 DP 589169	No change – remains an isolated dwelling
3	358636	6370028	32.798625909° S 151.490216657° E	Residence	6 Bowditch Avenue, Loxford	Lot 2 DP 522561	No change – remains a suitable representative location for the small number of dwellings at the western end of Bowditch Avenue
4	359178	6370182	32.797306852° S 151.496026935° E	School; TAFE NSW – Kurri Kurri	McLeod Road, Loxford	Lot 8 DP 1082569	No change to the location of buildings at the TAFE site
5	359161	6370579	32.793724703° S 151.495905713° E	Farmhouse, Bowditch Avenue	18 Bowditch Avenue, Loxford	Lot 458 DP 755231	The dwelling and small outbuildings on this lot have been demolished and a large industrial shed has been built. This location remains a suitable representative location for the shed and the nearby dwelling on the adjoining lot
6	360689	6370984	32.790267457° S 151.512280073° E	Residence	Moorebank Road, Cliftleigh		These coordinates now correspond to the western end of Moorebank Road in the new residential subdivision of Cliftleigh (approximately outside 30 Moorebank Road). The coordinates are a suitable representative location for the dwellings in this subdivision
7	360286	6370603	32.793651978° S 151.507920262° E	Residence	10 Howe Street, Heddon Greta	Lot 261 DP 1066601	No change – remains a suitable representative location for the dwellings in the northern part of Heddon Greta
8	360157	6369986	32.799199417° S 151.506449976° E	Residence	3 Errol Crescent, Heddon Greta	Lot 401 DP 1127085	There are a couple of new dwellings on Errol Crecent adjacent to this residence. This location remains a suitable representative location for the dwellings in the central part of Heddon Greta
9	361486	6372171	32.779664278° S 151.520966054° E	Residence	532 Main Road, Cliftleigh	Lot 2 DP 1249763	No change – remains an isolated dwelling

Sensitive receptor ID #	Eastings	Northings	Latitude and longitude	Description	Address	Lot and DP	MetroMap Aug 2024 satellite image review
10	360220	6373188	32.770333026° S 151.507604933° E	Farmhouse	464 Cessnock Road, Gillieston Heights	Lot 1 DP 73597	No change – remains an isolated dwelling that is nearer to the project site than any other dwellings in Gillieston Heights
11	358945	6369119	32.806862587° S 151.493377534° E	Residence	21 Acacia Street, Kurri Kurri	Lot 12 DP 758590	No change – remains the dwelling in Kurri Kurri that is nearest to the project site
12	358289	6368815	32.809519412° S 151.486326366° E	School, Kurri Kurri High School	11 Deakin Street, Kurri Kurri	Lot 762 DP 755231	No change to the location of buildings at the school site
13	356482	6369542	32.802728952° S 151.467143540° E	Residence	67 Government Road, Loxford	Lot 1 DP 560471	No change – remains the dwelling in Weston that is nearest to the project site
14	356566	6370702	32.792279704° S 151.468219836° E	Residence, Bishops Bridge Road	103 Bishops Bridge Road, Sawyers Gully	Lot 322 DP 755231	No change – remains an isolated dwelling that is nearer to the project site than dwellings in the southern part of Sawyers Gully
15	356089	6371047	32.789106293° S 151.463180890° E	Residence	146 Sawyers Gully Road, Sawyers Gully	Lot 111 DP 833367	No change – remains the nearest dwelling to the project site in the central part of Sawyers Gully
16	355748	6371678	32.783371574° S 151.459638594° E	Residence	78 Lumby Lane, Sawyers Gully	Lot 12 DP 1082775	This residence is unchanged however there is now also an industrial shed on the lot. It remains the nearest dwelling to the project site in the northern part of Sawyers Gully

Assessment review

The results of the updated air quality impact assessment report prepared in August 2022 have been reviewed with consideration to the changes to local background air quality, the 2022 Approved Methods, and the NEPM advisory goals for particles as $PM_{2.5}$.

Carbon monoxide

The updated air quality impact assessment report predicted a cumulative maximum 1-hour averaged CO concentration at the most-affected surrounding sensitive receptor of 1.4 mg/m^3 when the project was running on diesel. As discussed above, the maximum 1-hour averaged background concentration in 2023 was 1.3 mg/m^3; 0.1 mg/m^3 lower than the 1.4 mg/m^3 adopted in the previous assessment. Considering this, and that the impact assessment criterion of the EPA's Approved Methods (2022) is 30 mg/m^3, the outcomes of the previous assessment for maximum 1-hour averaged CO remain unchanged.

Regarding maximum 8-hour averaged CO, the concentration measured in 2023 (1.0 mg/m^3) was equivalent to the value adopted in the previous assessment. The updated air quality impact assessment report predicted a concentration of 1.0 mg/m^3 at the most-affected surrounding sensitive receptor, well below the EPA's 10 mg/m^3 impact assessment criterion. On this basis, it is considered that the outcomes of the previous assessment for maximum 8-hour averaged CO remain unchanged.

Noting that the background value for 15-minute averaged CO in the previous assessment was derived from the adopted 1-hour value, and the previous assessment predicted a cumulative concentration (emissions from the project including background CO) more than 50 times below the EPA's 100 mg/m^3, it is also considered that the outcomes for maximum 15-minute averaged CO also remain the same.

Sulfur dioxide

Results from the updated air quality impact assessment report prepared in August 2022 for maximum 1-hour and 24-hour averaged SO_2 with the facility operating on diesel are reproduced in **Table 6.4**.

Table 6.4 SO_2 results summary at the most affected sensitive receptor for operations on diesel, from the updated air quality impact assessment report

Pollutant	Percentile and averaging time	2022 Approved Methods impact assessment criteria (µg/m^3)	Adopted background concentration (µg/m^3)	Cumulative concentration at most affected sensitive receptor (µg/m^3)
SO_2	Max, 1-hour	286	183.3	183.3
	Max, 24-hour	57	18.8	18.8

As shown in **Table 6.1**, the measured 2023 maximum 1-hour and 24-hour SO_2 background concentrations were 73 µg/m^3 and 16 µg/m^3 respectively; below the values adopted for the previous assessment listed in **Table 6.4**. Considering this and noting that the cumulative concentrations at the most affected sensitive receptor remain below the 2022 Approved Methods impact assessment criteria, the outcomes of the previous assessment for SO_2 with the proposed modification would remain unchanged.

Nitrogen dioxide

Results from the updated air quality impact assessment report prepared in August 2022 for maximum 1-hour and annually averaged NO_2 with the facility operating on diesel are reproduced in **Table 6.5**.

Table 6.5 NO_2 results summary at the most affected sensitive receptor for operations on diesel, from the updated air quality impact assessment report

Pollutant	Percentile and averaging time	2022 Approved Methods impact assessment criteria (µg/m^3)	Adopted background concentration (µg/m^3)	Cumulative concentration at most affected sensitive receptor (µg/m^3)
NO_2	Max, 24-hour	164	75.2	75.2
	Annual	31	16.1	16.3

The maximum 1-hour averaged NO_2 concentration applied was 75.2 µg/m^3. Noting that the Ozone Limiting Method was applied in the previous assessment, the maximum measured NO_2 background concentration in 2023 was lower (71 µg/m^3). Noting this and that the predicted maximum 1-hour averaged cumulative concentration remains well below the updated 164 µg/m^3 impact assessment criterion, the outcomes of the previous assessment for short-term NO_2 impacts remain unchanged.

Regarding annually averaged NO_2, the 2023 measured concentration was 17 µg/m^3, 0.9 µg/m^3 higher than the value adopted in the updated air quality impact assessment report. If this value was adopted, the resulting cumulative concentration at the most-affected sensitive receptor would be 17.2 µg/m^3. This remains well below the 31 µg/m^3 impact assessment criterion in the 2022 Approved Methods. On this basis, the proposed modification is not expected to result in exceedance of the required annually averaged limit for NO_2, as determined in the previous assessment.

Particulate matter as $PM_{2.5}$

Results from the updated air quality impact assessment report prepared in August 2022 for maximum 24-hour and annually averaged $PM_{2.5}$ with the facility operating on diesel are reproduced in **Table 6.6**.

Table 6.6 $PM_{2.5}$ results summary at the most affected sensitive receptor for operations on diesel, from the updated air quality impact assessment report

Pollutant	Percentile and averaging time	2022 Approved Methods impact assessment criteria (µg/m^3)	NEPM advisory goals (µg/m^3)	Adopted background concentration (µg/m^3)	Cumulative concentration at most affected sensitive receptor (µg/m^3)
$PM_{2.5}$	Max, 24-hour	25	20	24.9	25.1
	Annual	8	7	8.7	8.7

The results from more recent monitoring presented in **Table 6.1** show that:

- Maximum 24-hour averaged $PM_{2.5}$ concentrations have decreased. The value measured in 2023 was 17 µg/m^3, below the 24.9 µg/m^3 value adopted in the previous assessment.
- Annually averaged $PM_{2.5}$ concentration have also decreased. The 2023 measured value was 6.7 µg/m^3, below the 8.7 µg/m^3 value applied in the previous assessment.

Applying the background conditions from DHPI's Beresfield station in 2023, the resulting predicted cumulative concentrations at the most-affected sensitive receptor for the facility operating on diesel are provided in **Table 6.7**.

Table 6.7 $PM_{2.5}$ results summary at the most affected sensitive receptor for operations on diesel, using 2023 background concentrations

Pollutant	Percentile and averaging time	2022 Approved Methods impact assessment criteria (µg/m^3)	NEPM advisory goals (µg/m^3)	2023 measured background concentration (µg/m^3)	Cumulative concentration at most affected sensitive receptor (µg/m^3)
$PM_{2.5}$	Max, 24-hour	25	20	17.0	17.4
	Annual	8	7	6.7	6.7

With the lower 2023 background conditions, **Table 6.7** shows how the maximum 24-hour and annually averaged cumulative concentrations at the most-affected sensitive receptor would remain below both the 2022 Approved Methods impact assessment criteria and the NEPM advisory goals. This outcome shows how background levels (rather than contributions from the project) dominate cumulative levels at surrounding sensitive receptors.

6.2 Greenhouse gas emissions

6.2.1 Introduction

The potential greenhouse gas impacts of the project were assessed in the EIS through the calculation of greenhouse gas emissions in accordance with National Greenhouse and Energy Reporting Scheme methods. The calculations identified 244 kt CO_2e Scope 1, 0.5 kt CO_2e Scope 2 and 49 kt CO_2e Scope 3 greenhouse gas emissions during the first year of operation.

6.2.2 Assessment boundary and scenarios

The assessment boundary for this modification involves solely the first year of project operation (given that construction of the project is nearly complete, and that no changes are proposed for the standard operation i.e. years 2 to 30, nor for decommissioning). As with the assessment of year one emissions in the EIS, the assessment boundary considers the following emissions sources:

- Emissions from the combustion of fuel in the turbines
- Emissions from the combustion of diesel in backup generators
- Emissions associated with electricity consumed on site
- Haulage to site of plant inputs (mainly of diesel fuel)
- Haulage of waste from site.

Following the submission of the EIS and the approval of the project, two operational changes to the project were made based on conditions of approval A8 and A9:

> *A8. Fuel burning equipment must not be operated for the purpose of generating electrical power at the premises for more than 1,100 cumulative hours per calendar year.*
>
> *A9. Fuel burning equipment must not be fired on diesel for the purpose of generating electrical power at the premises for more than 175 cumulative hours per calendar year.*

These conditions increase the standard annual turbine operations (i.e. months 6 – 12 of year one, and years 2 to 30) from 1,051 hours (876 hours on natural gas, 175 hours on diesel) to 1,100 hours (925 hours on natural gas, 175 hours on diesel – although in reality the turbines will be fired almost exclusively on natural gas). Hence, to better represent the actual case for year one, rather than the case at the time of the EIS assessment, the operations for year one months 6 to 12 were updated from 438 hours on natural gas (half of the annual 876 hours) to 462.5 hours on natural gas (half of the annual 925 hours). Hours on diesel for months 6 to 12 were reduced from 87.5 hours (half of the annual 175 hours) to 75 hours, which in conjunction with the 100 hours of diesel operation in months 1 to 6 reaches the 175 hour limit on diesel operation.

Based on the above changes, alongside the proposed modification covered by this report, two scenarios were adopted to provide a comparison of the difference in emissions:

- Updated EIS First Year, i.e. First year of operations as per the EIS, updated to reflect operations as per conditions of approval A8 and A9
- Modification 3 First Year, i.e. First year of operations including Modification 3 (1,100 hours on diesel and no hours on natural gas).

To provide a more accurate comparison between scenarios, all emissions factors used in the EIS assessment were updated from the 2020 edition of the *Australian National Greenhouse Accounts Factors* (Department of Climate Change, Energy, the Environment and Water, 2020) to the current version (2023 edition).

6.2.3 Identification of sources of emissions

Based on the above assessment boundary, the emissions associated with each emissions source were calculated. In line with the requirements of the guideline, emissions were divided into Scope 1, Scope 2 and Scope 3 emissions. Further, Scope 1 emissions were divided into CO_2, CH_4 and N_2O emissions. The full emission derivation process, including inputs and emission factors, are detailed in **Appendix B**. The calculated emissions for the three scenarios are detailed in **Table 6.8**.

Table 6.8 Calculated greenhouse gas emissions for assessment scenarios

Source	Annual quantity	Annual energy consumption (GJ)	Annual emissions (tCO_2e)						
			Scope 1 CO_2	Scope 1 CH_4	Scope 1 N_2O	Scope 1 CO_2e	Scope 2 CO_2e	Scope 3 CO_2e	All scopes
Updated EIS First Year									
Diesel combustion in gas turbines (Months 1 - 6)	16,114 kL	622,013	43,479	62	124	43,665	0	10,761	**54,426**
Natural gas combustion in gas turbines (Months 6 - 12)	85,776,926 m^3	3,371,033	173,271	337	101	173,709	0	47,194	**220,904**
Diesel combustion in Gas turbines (Months 6 - 12)	11,419 kL	440,767	30,810	44	88	30,942	0	7,625	**38,567**
Diesel combustion in generator	9.6 kL	371	26	<0	<0	26	0	6	**32**
Grid energy usage	5781 MWh	2,079	0	0	0	0	393	29	**422**
Plant input haulage	936,560 t.km Full 26,759 km Empty	NA	0	0	0	0	0	71	**71**
Plant waste haulage	214 t.km Full 15km Empty	NA	0	0	0	0	0	<1	**<1**
Total		**4,436,263**	**247,585**	**443**	**314**	**248,343**	**393**	**65,687**	**314,423**

Source	Annual quantity	Annual energy consumption (GJ)	Annual emissions (tCO_2e)						
			Scope 1 CO_2	Scope 1 CH_4	Scope 1 N_2O	Scope 1 CO_2e	Scope 2 CO_2e	Scope 3 CO_2e	All scopes
Modification 3 First Year									
Diesel combustion in gas turbine	167,084 kL	6,449,458	450,817	645	1,290	452,752	0	111,576	**564,328**
Diesel combustion in generator	9.6 kL	371	26	<0	<0	26	0	6	**32**
Grid energy usage	5781 MWh	2,079	0	0	0	0	393	29	**422**
Plant input haulage	5,681,302 t.km Full 162,323 km Empty	NA	0	0	0	0	0	432	**432**
Plant waste haulage	214 t.km Full 15km Empty	NA	0	0	0	0	0	<1	**<1**
Total		6,451,908	450,843	645	1,290	452,778	393	112,043	565,214

As displayed in **Table 6.8**, emissions have been predicted to increase by approximately 80 per cent between the Updated EIS First Year and the Modification 3 First Year. This is predominately the result of the difference in maximum possible hours between the two scenarios (637.5 hours vs 1,100 hours), while also being influenced by the Modification 3 First Year's exclusive use of diesel compared to the Updated EIS First Year's mix of diesel and natural gas.

In order to provide a more equal comparison between the scenarios, the t CO_2e Scope 1 emissions per hour of operation and per megawatt produced have been developed. These have been displayed in **Table 6.9**. Emissions per hour and per megawatt have been provided for standard operations (i.e. years 2 to 30) as well for an additional comparison.

Table 6.9 Comparison of emissions per hour and per megawatt hour

Scenario	Total annual operational hours	Total annual gross electrical production (MWh)	Total annual turbine Scope 1 emissions (t CO_2e)	Scope 1 emissions per hour (t CO_2e/hr)	Scope 1 emissions per MW (t CO_2e/MWh)
Updated EIS First Year	638	459,546	248,316	390	0.54
Modification 3 First Year (Diesel only)	1,100	651,657	452,752	412	0.69
Updated EIS Years 2 – 30 (925 hours on natural gas and 175 hours on diesel)	1,100	808,005	419,453	381	0.52
Updated EIS Years 2 – 30 (Natural gas only)	1,100	837,587	413,153	376	0.49

As displayed in **Table 6.9**, the lower emissions efficiency of diesel means that the Modification 3 First Year would produce approximately 28 per cent more tonnes of CO_2e per MW, and five per cent more tonnes of CO_2e per hour. In comparison to standard operations (Years 2 to 30), emission efficiency differences would be similar, with the Modification 3 First Year producing 33 per cent more tonnes of CO_2e per MW than standard operations and eight per cent more tonnes of CO_2e per hour. Against an optimal year of standard operations (Years 2 – 30 on natural gas only), this increases to 40 per cent more tonnes of CO_2e per MW and 10 per cent more tonnes of CO_2e per hour.

6.2.4 Discussion

Noting that the project is electricity generating infrastructure, it contributes to the 198 million t CO_2e sectoral safeguard baseline for National Greenhouse and Energy Reporting Scheme Safeguard Mechanism. While the proposed Modification 3 First Year is expected to increase emissions by up to 80 per cent compared to the Updated EIS First Year, the difference in tonnes of CO_2e is small relative to the sectoral baseline. Given that this modification is also for a single year of operation, it is unlikely for the modified year to have a significant impact on the project's overall contribution sectoral baseline.

To place the emissions from the first year of operations in the context of state emissions, emissions associated with the first year of operation have been compared against the projected NSW emissions for 2025, displayed in **Table 6.10**.

Table 6.10 Comparison of year one project emissions against projected NSW 2025 emissions

Scenario	Scope 1 emissions (Mt CO_2e)	2025 base case NSW emissions (Mt CO_2e)[1]	2025 current policy NSW emissions (Mt CO_2e)[2]	Percentage of 2025 base case NSW emissions	Percentage of 2025 current policy NSW emissions
Updated EIS First Year	0.25	126.09	122.44	0.20%	0.20%
Modification 3 First Year (Diesel only)	0.45			0.36%	0.37%
Updated EIS Years 2 – 30 (925 hours on natural gas and 175 hours on diesel)	0.42			0.33%	0.34%
Updated EIS Years 2 – 30 (Natural gas only)	0.41			0.33%	0.34%

Notes

1 *NSW Greenhouse Gas Emissions Projections, 2022–2050* (The Central Resource for Sharing and Enabling Environmental Data in NSW, 2024), 'Business as usual' scenario

2 *NSW Greenhouse Gas Emissions Projections, 2022–2050* (The Central Resource for Sharing and Enabling Environmental Data in NSW, 2024), 'Program/policy abatement as currently tracking' scenario

The Modification 3 Year is anticipated to contribute an approximately 80 per cent increase to the State's greenhouse gas emissions in comparison to the Updated EIS First Year. However, this overall contribution remains around 0.36 – 0.37 per cent of the State's emissions. Furthermore, the Modification 3 First Year's contribution is only approximately nine per cent greater than the standard operation (Years 2 – 30) contribution to State emissions. As such, despite the relatively large difference in first year emissions between scenarios, the overall contribution between the Modification 3 First Year and the remaining years is not as significant and is unlikely to have a long term impact on the Project's contribution to state emissions.

6.2.5 Draft NSW EPA Guide for Large Emitters

The NSW Environment Protection Authority (EPA) recently issued draft guidance on the greenhouse gas assessment and mitigation plan to be prepared for large emitting projects within environment impact assessments. Public comment on the draft *NSW EPA Guide for Large Emitters* (EPA, 2024) was sought between 20 May 2024 and 1 July 2024.

Large emitters are defined in the draft guide as including projects involving new facilities that would be regulated by the EPA and that are likely to have large emissions. Whether a project has large emissions is determined by three criteria:

1. The project requires development assessments and approvals under the EP&A Act
2. The project involves one or more scheduled activities under Schedule 1 of the *Protection of the Environment Operations Act 1997* and/or will be carried out at an existing licensed premises
3. The project is likely to emit 25,000 tonnes or more of scope 1 and 2 emissions (CO_2e) in any financial year during the operational life of the project (based on planned operational throughput and as designed).

The project meets these three criteria and is therefore a large emitter for the purposes of the draft guide. The draft guide also applies to modifications to development consents where the modification will result in large emissions. The proposed modification would potentially result in a change in greenhouse gas emissions of 25,000 tonnes or more of scope 1 and 2 emissions (CO_2e).

As the guide remains in draft format and is not yet official NSW Government policy, it is not currently applicable to either the project or the proposed modification.

6.3 Noise emissions

Section 5.2.1 of the revised noise impact assessment report (Appendix G of the response to submissions report) divided operational noise sources into two grouping:

- The power islands, which includes the gas turbines, generator, stack and other supporting equipment. Sound power levels for noise sources within the power islands were provided in Table 5.2 of the revised noise impact assessment report
- The balance of plant, which includes the diesel fuel unloading station, water pumps and demineralisation plant. Sound power levels for noise sources within the balance of plant were provided in Table 5.3 of the revised noise impact assessment report.

The revised noise impact assessment report was based on a concept design and sound power levels were based on representative equipment that was considered typical of the offerings from major equipment suppliers.

The revised noise impact assessment report also considered operational traffic noise. Two events that would result in higher operational traffic than normal were considered, including the situation where there would be 12 B-double tanker movements per day (six inbound trips and six outbound trips) associated with the transportation of diesel fuel to and from the power station.

Modelling of noise emissions from the operation of the project was based on all noise sources at the power station occurring simultaneously, as well as the two scenarios that would generate higher than normal operational traffic. The modelling considered the impact of operational noise emissions occurring at any time of the day or night, and during either 'standard' or 'noise-enhancing' meteorological conditions.

Modelled operational noise levels at the nearest sensitive receptors to the power station were compared to the day, evening and night project noise trigger levels established in section 4.2.4 of the revised noise impact assessment report for receptors in the five noise catchments identified in the vicinity of the project site.

The modelling showed that operational noise levels would comply with the project noise trigger levels at all receptors at all times (refer to section 6.4 of the revised noise impact assessment report. This includes the noise emissions that would occur when the gas turbines are fired by diesel fuel, as the modelling included all equipment that would be operational in this situation as well as the fuel tanker movements required to maintain the plant's diesel fuel stores.

The project noise trigger levels were adopted as noise limits in the Infrastructure Approval (condition B21, Table 5) and were a design requirement during detailed design of the project. Therefore, even though the equipment selected for use at the power station is not the same as the representative equipment used to model the noise emissions from operation of the project in the EIS, it was selected on the basis that it would not result in worse operational noise emissions than the project noise trigger levels established in the EIS.

In summary, the proposed modification involves noise-generating activities that were modelled in the EIS and which were shown to comply with the established project noise trigger levels. Furthermore, as the project noise levels became the noise limits in the Infrastructure Approval and were a design requirement during detailed design of the project, even where the selected equipment differs from the representative equipment in the EIS, the same noise performance requirements would be achieved. The modification would therefore not change the approved project operational noise assessment.

6.4 Traffic

6.4.1 Diesel fuel deliveries

The number of B-double tanker trips required to refill the diesel fuel storage tanks will depend on the hours of operation of the gas turbines using diesel fuel, the rate of diesel consumption per hour of gas turbine operation, and the capacity of the tankers. The storage capacity of the tanks would also be a factor, however as noted in section 2.2.3 of the EIS, the tanks were sized to store sufficient fuel to enable the power station to operate at maximum capacity for three consecutive days with each gas turbine operating for 10 hours per day. This was considered the maximum duration of a peak demand period during which the power station would operate and by sizing the storage tanks to have sufficient capacity to operate for the duration of such a peak the capacity of the tanks ceases to be a constraint.

Data used during preparation of the EIS to determine the frequency of tanker operations required to store sufficient diesel fuel on-site to supply the gas turbines when operating on diesel fuel was used to estimate the number of days that tankers would need to deliver diesel fuel to the power station for the worst-case scenario under the proposed modification of 1,100 hours of operation on diesel fuel in 2025.

Six tanker deliveries per day becomes a constraint on the power station's capacity to operate at more than 597 hours of operation on diesel fuel only. If the plant were to operate at the maximum of 1,100 hours on diesel fuel, tanker deliveries would need to increase to a maximum of 12 per day to ensure there is sufficient diesel fuel stored on-site to not constrain operation.

Section 17.3.2 of the EIS identified that tanker delivers would occur between 8.00 am and 4:00 pm. Only one tanker can unload at a time, and it takes one hour to connect the tanker to the extraction pump, unload the diesel fuel, and then disconnect the tanker. The eight-hour period proposed in the EIS for tanker unloading is therefore insufficient for days on which the revised maximum of 12 tanker delivers per day occur. A revised tanker operating period of 6:00 am to 6:00 pm is therefore proposed in 2025.

6.4.2 Other changes to traffic

There would be a small increase in truck movements associated with the additional water treatment chemicals required when the gas turbines operate on diesel fuel compared to natural gas. However, this change would have a negligible impact on the amount of operational traffic generated by the power station in 2025.

6.4.3 Impacts on the traffic network

The EIS assessed operational vehicle movements, including six tanker deliveries per day, as not being expected to impact on the operation of the surrounding road network as these roads currently carry low traffic volumes and have spare capacity to accommodate the relatively low increase in operational traffic. An increase in the maximum number of tanker movements to 12 per day would not change this conclusion, noting that the tanker deliveries are necessarily spaced at least an hour apart due to only one tanker being able to unload at a time and unloading taking one hour. Also, an increase in the number of days on which there are tanker movements would not change this conclusion as this is just a change in the frequency of the impact and not its intensity.

6.5 Water consumption

Section 14.3.2 of the EIS provided a water balance for the operational phase of the project that included the following key water demands:

- Input to the demineralised water treatment plant for the production of demineralised water for wet compression/fogging and NO_x emission control when operating on diesel
- Inlet air / evaporative cooling for the gas turbines
- Supply to workshops, amenities and administration buildings, including kitchens, safety showers, eyewash facilities, etc.
- Make-up supply for the firefighting and emergency facilities
- Plant wash down.

The EIS noted that operational water demands will vary depending on the type of fuel used, with natural gas having a significantly lower water consumption than diesel fuel. Significant variation in annual water usage is also dependent on ambient temperature and the utilisation rate of evaporative coolers and wet compression fogging.

Indicative water demands based on the largest expected F Class gas turbine were summarised in Table 14.5 and Table 14.6 of the EIS, which are reproduced below in **Table 6.11** and **Table 6.12** respectively.

Table 6.11 Estimated water demand for main components when operating on natural gas

Component	Water demand for 2 x units (kilolitres/hour)
Potable water: Total	133.1
Evaporative cooler make-up	67.7
Demineralised plant supply	65.3
Domestic use	0.075
Demineralised water: Total	**64.8**
Wet compression / fogging	57.6
NO_x emission control	0.0
Compressor washing (as required)	7.2

Table 6.12 Estimated water demand for main components when operating on diesel fuel

Component	Water demand for 2 x units (kilolitres/hour)
Potable water: Total	133.1
Evaporative cooler make-up	67.7
Demineralised plant supply	65.3
Domestic use	0.075
Demineralised water: Total	**151.2**
Wet compression / fogging	0.0

Component	Water demand for 2 x units (kilolitres/hour)
NO_x emission control	144.0
Compressor washing (as required)	7.2

As shown in the above tables, the difference in water demand when operating the gas turbines on diesel fuel compared to natural gas is due to water consumed in NO_x emission control when operating on diesel fuel. As explained in section 2.2.5 of the EIS, diesel fuel burns at a higher temperature than natural gas fuel, and this results in thermal NO_x being produced at a higher rate compared with natural gas fuel. Demineralised water will be injected into the combustion chamber to reduce the combustion temperature and hence the formation of thermal NO_x when firing the gas turbines on diesel fuel. In comparison, water cooling is not required when the gas turbines are fired on natural gas because the plant incorporates dry low emission combustors, which operate on the principle of lean premixed combustion to overcomes the need for water and/or steam cooling or injection. The lean fuel and air mixture results in a lower firing temperature during combustion and consequently less generation of thermal NO_x.

Indicative total annual water demand for operation of the project was estimated in the EIS at about 80 megalitres based on each turbine operating for 876 hours on natural gas and 175 hours on diesel fuel. This same calculation has been carried out for the proposed modification and has found that water demand in 2025 would increase to about 235 megalitres based on each gas turbine operating for 1,100 hours on diesel fuel.

The increase in water demand would not require an increase in the rate at which Hunter Water has agreed to supply water to the power station.

6.6 Waste

As discussed in **Section 3.9**, operation of the gas turbines using diesel fuel results in some liquid waste from the demineralisation plant that will be managed as trade waste subject to a trade waste agreement between Snowy Hydro and Hunter Water. Section 14.3.2 of the EIS estimated that the power station would generate about 16.2 megalitres of wastewater per annum based on each gas turbine operating for 876 hours on natural gas and 175 hours on diesel fuel. Using the same data as that used in the EIS, the proposed modification is estimated to generate about 34 megalitres of wastewater in 2025 based on each gas turbine operating on diesel fuel for 1,100 hours.

The maximum rate at which the power station produces wastewater would remain the same, only the amount of time when wastewater is being produced would increase.

6.7 Other environmental factors

The proposed modification would not impact any of the other environmental factors that were considered in the EIS. For example:

- There would be no change in the project's construction or operational footprints, and therefore there would be no change in impacts to terrestrial biodiversity or heritage
- There would be no change to the built form of the power station, and therefore there would be no change in visual impacts
- No new ground disturbance is proposed, and therefore there would be no change in impacts to soils.

6.8 Operating hours

As noted in **Section 1**, the power station is designed to operate as a 'peak load' generation facility and it incorporates fast start heavy duty gas turbines, which are suited to frequent start-up and shut-down operation. Likely operating hours per annum were expressed in the EIS in terms of 'capacity factor', which is the proportion of actual energy generated per year (expressed in megawatt hours) compared with the total energy that could have been produced if operating at full load for every hour of the year (expressed in megawatt hours). Approval was sought for operation at a capacity factor of 12 per cent in any given year, equal to 1,051 hours of operation of each gas turbine based on 876 hours on natural gas and 175 hours on diesel fuel, all at full load. However, the EIS noted that the power station was more likely to operate at a capacity factor of two per cent in any given year.

Conditions A8 and A9 of the conditions of approval limits operations of each gas turbine to 1,100 cumulative hours per calendar year of which a maximum of 175 hours per gas turbine is permitted on diesel fuel (refer to **Section 1.1**).

Actual operating hours in any given calendar year will depend on market conditions and particularly supply and demand imbalances and whether there is a prevalence of very high temperature days that trigger demand spikes. If market conditions are fairly normal in 2025, then the power station is likely to operate at about the two per cent capacity factors specified in the EIS, meaning impacts will be well below those described in the preceding sections.

7. Justification for the proposed modification

The justification for the project provided in section 23.1 of the EIS is also applicable to the proposed modification. The proposed modification would enable the project benefits identified in the EIS to be realised from the start of 2025 rather than delaying these benefits until construction of the gas pipeline is completed. The benefits of the project identified in the EIS include:

- Improved electricity dispatchability and hence reliability of electricity supply in the NEM. Peak load generation facilities provide firming of renewable generation projects' intermittent electricity supply to the NEM. Without dispatchable and firming generation or storage capacity, a power system that is solely reliant on intermittent renewable generation will be prone to unacceptable levels of customer supply interruption
- The project would benefit communities, businesses and industry by increasing the reliability of supply in the NEM. The project will support overall downward pressure on energy prices, supporting reduced electricity costs for households, businesses and industry through NSW and participating NEM jurisdictions over the medium to long term
- The project is an important component in the long-term transition to renewable energy by facilitating the displacement of carbon-based electricity generation, Together, peak load generation facilities and renewable energy generation are part of a group of technologies that will provide emissions reduction while meeting the necessary rapid start up, generation capacity, plant reliability and cost effectiveness necessary to meet NSW electricity demand
- The project is consistent with the released NSW energy strategy as it builds essential efficiency and reliability into the network, which will be needed during the transition period as existing generation assets are retired.

The above benefits of the project remain current. The need for peak-load facilities is supported by the Australian Energy Market Operator's latest *Gas Statement of Opportunities for Australia's East Coast Gas Market* (March 2024), which notes that unexpected events in the power system are still expected to require firming support from peak load generation facilities. It cites the recent example from August 2023, when several planned outages on the Heywood interconnector coincided with low wind outside daylight hours, resulting in increased generation by peak load facilities.

8. References

Australian Energy Market Operator (2024), *Gas Statement of Opportunities for Australia's East Coast Gas Market*. Australian Energy Market Operator Limited, March 2024

The Central Resource for Sharing and Enabling Environmental Data in NSW (2024), *NSW Greenhouse Gas Emissions Projections, 2022–2050*. Accessed August 2024

Department of Planning and Environment (2022), *State Significant Infrastructure Guidelines – Preparing a Modification Report, Appendix F to the State Significant Infrastructure Guidelines*. NSW Department of Planning and Environment, Parramatta, October 2022

Department of Planning, Housing and Infrastructure (2024), *Undertaking Engagement Guidelines for State Significant Developments*. NSW Department of Planning, Housing and Infrastructure, Parramatta, March 2024

NSW Environment Protection Authority (2024), *NSW EPA Guide for Large Emitters*. Draft for consultation. NSW Environment Protection Authority, Parramatta, May 2024

NSW Environment Protection Authority (2016). *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*. NSW Environment Protection Authority, Sydney, November 2016

Appendix A. Updated project description

Following is the full text of sections 2.1 and 2.5 of the EIS project description (as amended by approved project modifications 1 and 2) showing the changes as a result of the proposed modification. Changes are shown in red font. The numbering of these sub-sections matches that of the EIS. Sections 2.2 to 2.4 of the EIS are not shown below because they would not change as a result of the proposed modification.

2.1 Proposal summary

Snowy Hydro has secured approval to develop a new gas fired power station in the Hunter Valley to increase its dispatchable generating capacity in NSW. The Project will be able to supply electricity to the grid at short notice during periods of high electricity demand including during low supply periods from intermittent renewable sources or during supply outages at other base load power stations.

The power station will be a dual fuel (gas and diesel), "peak load" generation facility supplying electricity at a capacity of up to approximately 660 MW which will be generated via two heavy-duty Open Cycle Gas Turbines.

The Project involves the construction and operation of a power station together with other associated infrastructure. The major supporting infrastructure required for the Project will be a 132 kV electrical switchyard located adjacent to the power station but within the Project Site. A new gas lateral pipeline (to be developed by a third party, and subject to a separate planning approval) will also be required to supply gas to the power station, but is not part of this Project. The Project will connect into existing 132 kV electricity transmission infrastructure located near the Project Site.

The Project has a capital cost of approximately $610 million, and the power station is anticipated to be fully operational at the beginning of calendar year 2025. An overview of the modified Project, listing details of the development for which a modified approval is sought, is summarised in Table 2.1.

Table 2.1 Key Proposal elements

Proposal element	Summary
Proposal address	73 Dickson Road, Loxford NSW 2326.
Project area	The Project Site comprises approximately 12.75 ha, and is shown overlaid on existing cadastral boundaries in Figure 1.1. The land was described in the Project EIS as: Part Lot 319 DP 755231 Part Lot 769 DP 755231. The Project Site has undergone a boundary adjustment/re-subdivision since publication of the Project EIS. The property description (Lot/DP) for the Project's operational footprint has therefore changed to: Lot 1, Part Lot 2 in DP1276814 In addition, the (modified) Project construction footprint now includes an additional (approximately) 13.3 ha on Part Lot 3, DP456769, as illustrated in Figure 1-2 in the main body of the modification report for the Precinct 3 B Modification and a further 1.12 ha of Part Lot 420 in DP 755231 for the proposed TWA facility assessed in modification report 2. These two additional areas would only be required during construction.
Development footprint	Proposed development area occupies land having a total area of 12.75 ha. Each component of the proposal occupies part of the two Lots/DPs described above, as follows: ▪ Power Island area 6.81 ha ▪ Switchyard area 1.29 ha ▪ Buffer area 3.73 ha ▪ Asset Protection Zone (APZ) 0.61 ha

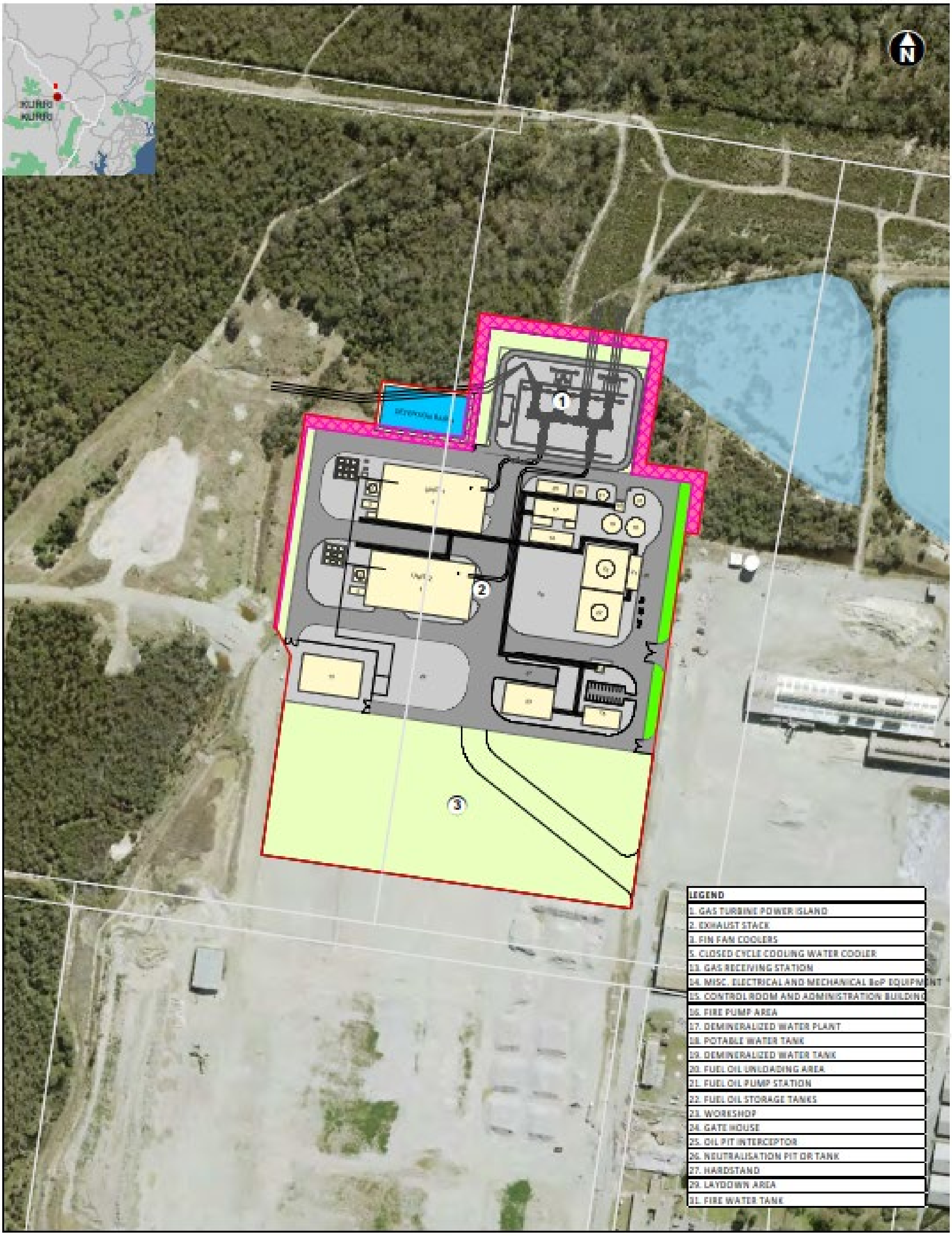
Proposal element	Summary
	▪ Stormwater basin (subject to detailed design) 0.3 ha.
Gas Turbine Power Island	Two heavy duty F-class OCGTs, with the necessary balance of plant infrastructure, generator circuit breakers and generator step-up transformers.
132 kV Electrical switchyard	Circuit breakers, bus-bars, isolators, series reactor and switchyard equipment including either underground cables or overhead line support gantries between the power station and the switchyard. Switchyard would be either air-insulated or gas-insulated; subject to detailed design. Switchyard voltage would be 132 kV. The switchyard would connect directly to existing Ausgrid overhead 132 kV transmission lines.
Zoning	The Proposal Site is currently zoned RU2 Rural Landscape under the Cessnock Local Environmental Plan 2011 (Cessnock LEP). The Proposal Site and surrounds are subject to a rezoning proposal. The Proposal Site is expected to be rezoned as IN3 Heavy Industrial if the rezoning proposal is approved.
Supporting balance of plant infrastructure of the Proposal	▪ Internal site access roadways ▪ Water storage tanks (potable, fire and demineralised), pumps, demineralised water plant, piping ▪ 2 x Diesel fuel storage tanks, effective volume of approximately 1.75 ML each, and forwarding pumps ▪ Diesel tanker truck unloading facilities ▪ Other (non-fuel) truck loading/unloading facilities ▪ Control room ▪ Concrete bunded areas with drains for liquid fuel tanks, liquid chemicals store, oil filled transformers and other facilities where such liquids could leak ▪ On site oily water separation system, with pit or tank storage, including facilities for: - Diesel fuel unloading area - Diesel fuel storage tanks bund - Gas turbine diesel fuel skid - Gas turbine and generator lube oil area - Gas turbine wash drains - Generator step up transformer bund. ▪ Concrete foundations, bitumen roadways, concrete surfaces in liquid fuel unloading station and gas turbine unit maintenance areas ▪ Stormwater drainage system e.g. pits, pipes, triple interceptor or equivalent, pumps (as required) ▪ Security fence, security lighting, stack aviation warning lights (if required) and surveillance system ▪ Office/administration buildings and amenities ▪ Workshop, warehouse/storage areas ▪ Communication systems ▪ Occupational health and safety systems including an emergency warning and evacuation system ▪ Firefighting system including water storage, pumps, hydrants and deluge systems (as required) ▪ Emergency diesel generator(s) with associated internal fuel storage

Proposal element	Summary
	▪ Closed circuit cooling systems for small on-site heat exchangers ▪ Local electrical switch/control rooms ▪ Laydown areas ▪ Landscaped areas and staff parking ▪ Other ancillary facilities located within the Proposal Site (see Figure 2.1).
Existing supporting infrastructure (off site)	▪ Public road network including Hart Road and M15 Hunter Expressway ▪ Waste and wastewater disposal facilities in the region ▪ Auxiliary power supply network.
Proposed water management	Potable water and wastewater/ trade waste would be connected to existing Hunter Water infrastructure. Supply to the Proposal Site boundary would be by others. Water storage: ▪ 2 x fire water tanks, effective volume approximately 0.5 ML (total 1.0 ML) ▪ 1 x potable water tank, effective volume approximately 1.6 ML ▪ 1 x demineralised water tank, effective volume approximately 1.6 ML ▪ Sewage system for the Proposal would connect to the Hunter Water sewer network ▪ Stormwater drainage system for collection and discharge of rainwater will be discharged to the environment via a stormwater basin (see Figure 2.1) ▪ Trade waste water treatment and discharge to the Hunter Water sewer network ▪ Sumps or tanks for collection of waste effluent prior to offsite disposal.
Proposed commencement of operation	~~Approximately August to December 2023.~~ Early 2025.
Anticipated life of the Proposal	Approximately 30 years.
Design life of mechanical and electrical plant	30 years.
Design life of civil and structural plant	50 years.
Construction duration	Approximately two years.
Construction hours	It is anticipated that works would be undertaken mostly during standard construction hours (7:00 am to 6:00 pm weekdays and 8:00 am to 1:00 pm on Saturdays). Out-of-hours construction activities would be conducted as required, e.g. delivery of large items of plant requiring oversize vehicles.
Construction traffic	Approximately 460 light vehicles per day and 130 heavy vehicles per day during the peak of construction.
Construction workforce	Expected peak construction workforce of approximately 650 full time equivalents (FTE).
Operational workforce	Permanent site staff numbers are not expected to exceed an average of 10 FTE. A small number of additional support staff and deliveries of consumables, waste disposal,

Proposal element	Summary
	sanitary services, and specialist maintenance staff may also be required on a weekly basis. Potential contractor workforce of up to 50 persons during infrequent maintenance vents, outages etc.
Capacity factor	The Proposal is seeking approval for a capacity factor[1] of up to 10 per cent on natural gas and up to two per cent on diesel (providing a combined capacity factor of 12 per cent) in any given year. However, it is expected that likely operations would result in a capacity factor of two per cent in any given year. The EIS assessments are based on the Proposal operating 12 per cent of the year at 100 per cent plant load.
TWA facility	The TWA facility would house up to 200 workers which will facilitate 24/7 construction of the Project. The facility would be comprised of prefabricated buildings joined by covered walkways including a reception/ office, approximately 26 eight person accommodation units, ablution building, kitchen, dining area, recreation building, laundry and BBQ area, refuse storage area and three generators for power supply. It is anticipated the workers would be on-site for 10 days and then have 4 days off during which time they would return to their normal place of residence.
Capital cost	Approximately $610 million

Notes

1 The capacity factor is the proportion of actual energy generated per year (expressed as MWh) compared with the total energy that could have been produced if operating at full load for every hour of the year (expressed as MWh). Conditions of approval A8 and A9 effectively supersede this proposed element.



Proposal Site
Asset protection zone
Detention basin
Sealed roadway
Crushed rock
Landscaping
Grass / Road base
Existing waterbodies
Existing cadastre
(1) Proposed Switchyard Area
(2) Proposed Plant Area
(3) Proposed Buffer Area

0 100 200 m

1:4,000 at A4
GDA2020 MGA Zone 56

Data sources:
Jacobs
Metromap (Aerometrex) 2020
NSW Spatial Services

Figure 2-1 Proposal Site Layout

2.5 Proposal operation

2.5.1 General

The Proposal would feature fast start heavy duty gas turbines, which are suitable for peaking power generation. The Proposal is seeking approval for a capacity factor of up to 10 per cent on natural gas and up to 2 per cent on diesel (providing a combined capacity factor of 12 per cent) in any given year. However, it is expected that likely operations would result in a capacity factor of 2 per cent in any given year. Annual start-ups would range from 50 to approximately 200 occasions per year. Start-up would take approximately 30 minutes to reach the full rated load.

The minimum gas supply pressure for a gas turbine unit is expected to be approximately 3.8 megapascal (MPa).

The Proposal would be fitted with a Continuous Emission Monitoring System (CEMS) to demonstrate ongoing regulatory compliance, confirm the operation of pollution control equipment, and evaluate operating and emission variability.

The Proposal would be staffed during regular hours of operation (see Section 2.5.2), but would be designed for unattended and fully automated operation. An integrated control system would be developed to operate the power station facility, providing a high level of automation. Control and monitoring of the facility would be from Snowy Hydro's control centre in Cooma, with local control at the Proposal Site taken as required.

The electrical switchyard will also be designed to be fully automated and is expected to be largely unmanned during operation.

It is possible that the gas connection infrastructure (new gas lateral pipeline and gas receiving station; being developed by others) may not be completed until approximately ~~six~~ twelve months after the Proposal's commissioning. Thus, if the Proposal needed to operate within the first scheduled ~~six~~ twelve months of operation, beginning approximately ~~August 2023~~ January 2025, it would need to operate on diesel depending on the timing for completion of construction of the gas lateral pipeline.

2.5.2 Operational hours and workforce

During operation, the Proposal would be operated remotely from Snowy Hydro's control centre in Cooma. On site staff would manage plant availability, regular maintenance requirements, functional tests, and facility upkeep. Permanent site staff numbers are not expected to exceed an average of 10 full time equivalent persons (FTE). A small number of additional support staff and deliveries of consumables, waste disposal, sanitary services, and specialist maintenance staff may also be generated on a weekly basis.

Where larger maintenance events occur, such as outages for turbine inspections, additional contract staff would attend the site, with a workforce up to approximately 30-50 personnel for the larger events.

As the electrical switchyard will also be designed to be fully automated, it is expected to be largely unmanned during operation with local operations and maintenance staff only entering the switchyard as required for specific operational requirements and when there are maintenance tasks to be completed.

It is anticipated that the power station site would be attended by staff during the hours of approximately 7:00 am – 4:00 pm weekdays. Outside of standard operating hours the site can continue to be operated remotely and a roster of staff members would be on-call to address any immediate operational or maintenance requirements.

2.5.3 Operational traffic

During typical operation of the plant, operational traffic would consist of commuting activity by the small onsite staff (Monday to Friday) and support and maintenance staff. It is also reasonable to expect that infrequent deliveries of consumables, waste disposal, sanitary services, and specialist maintenance staff (e.g. warranty repairs as required) would be made to the Proposal Site on a weekly or as-needed basis.

Increased traffic would occur at specific intervals throughout the life of the Proposal. This is expected to occur when:

- There is a diesel fuel delivery: B-double road tankers (approximate volume of 50 kL) would be used to refill the onsite diesel storage tanks if and when they are used. The refilling of the storage tanks is dependent on the number of times and hours the plant is run on diesel and is highly variable but could be expected to occur up to three times annually. For the purposes of this EIS, it is assumed that diesel fuel delivery occurs with a maximum of six tankers per day (12 movements total), until the tanks are refilled, except in 2025, when there would be a maximum of twelve tankers per day (24 movements total) during and for up to a week after each time that the gas turbines are operated on diesel fuel.
- In 2025, there would be a small increase in truck movements associated with additional water treatment chemicals and the additional waste generated by the power station when it operates on diesel fuel compared to natural gas.
- If unused, diesel may need to be replaced at approximately 12 to 24 month intervals (depending on the condition of the diesel); this may require up to 280 B-double vehicle movements in total to drain and refill the storage tanks (based on 70 tankers of 50 kL each; to drain and then refill). However, for planning and assessment purposes the assumption is a maximum of six tankers will enter Site each day (12 movements total), until the tanks are drained and refilled.
- Gas turbine inspection and maintenance: periodic minor inspections, hot gas path inspections and major inspections of each gas turbine and auxiliaries would be required. The timings of each would be largely dependent on the equivalent operating hours, starts per year, operating conditions and the service agreement philosophy adopted. The major overhaul event could increase the on-site workforce requirement by approximately 30-50 persons for a period of approximately six to eight weeks depending on the outage requirements
- Switchyard maintenance as required, although this will require a much smaller workforce compared to a gas turbine overhaul and is expected to occur very infrequently.

The expected operational traffic that would be generated by the Proposal is summarised in Table 2.4.

Table 2.2 Key Proposal elements

Event	Vehicle type	Maximum vehicle movements (per day)	Typical Arrival / Departure	Timing
Typical operation	Passenger	20 (10 during each peak hour e.g. AM and PM)	7:00 am / 4:00 pm	Weekdays
Deliveries etc.	Light commercial vehicle	4	Off-peak	Weekly
Diesel fuel refilling, during 2025	B double (3 axle)	24	6:00 am / 6:00 pm	Daily during or post operation of the GT on diesel
Diesel fuel refilling, from 1 January 2026	B double (3 axle)	12	8:00 am / 4:00 pm	Daily during or post operation of the GT on diesel, up to 3 times per year
GT major overhaul	Passenger (cars, vans, utilities)	80	6:00 am / 4:00 pm	6-week period, every ~10 years (6 days per week)

Event	Vehicle type	Maximum vehicle movements (per day)	Typical Arrival / Departure	Timing
GT major overhaul	Heavy rigid (cranes, trucks)	10	Off-peak	Ad-hoc arrivals prior/finish of overhaul, every ~10 years

2.5.4 Safety and emergency response

The design, construction, maintenance and operation of the Proposal would be in full compliance with applicable legislation and Australian codes and standards, incorporating recognised international standards including a comprehensive occupational health and safety management system certified to AS 4801.

Redundancy provisions would be factored into the design, construction and operation of all plant items for:

- Gas and diesel fuel handling and conditioning equipment
- Water treatment plant and supply
- Control and instrumentation systems
- Communication equipment
- Station and instrument air.

The Proposal would be designed to include an automatic shutdown to a safe condition in the event of an emergency. This includes automatic plant protection actions to preserve plant integrity and site safety by restoring plant to a safe and stable operating state. The plant would be designed with a high level of automation so that it can be operated unattended while remaining safe and fully operable.

All ancillary facilities and buildings including office buildings and site amenities, including in the electrical switchyard, would have life saving devices installed including smoke, fire and gas detection devices and firefighting equipment, as required. Operating personnel would be required to be trained in emergency response as the first responders to on-site incidents. The first response priority would be to remotely isolate fuel sources and coordinate with emergency services.

Emergency access and egress would be designed and constructed to allow for emergency services to access the facility without any barriers. Maintenance of the Proposal Site would include vegetation management where required and making sure the site is accessible at all times.

The Proposal would include CCTV for crime prevention, appropriate lighting and clear and evident signage for the safety of staff and contractors. The Proposal would also include cyber security measures to protect critical electronic components of the Proposal from cyber attack.

2.5.5 Emissions to air

During normal operations, the power station would emit certain gases as a by-product of the combustion of either gas or diesel fuel, depending on the fuel being used at any given time. Emissions from the power station would include:

- Oxides of nitrogen (NO_x), including nitric oxide (NO) and nitrogen dioxide (NO_2), resulting from oxidation of atmospheric nitrogen in high temperature combustion reactions
- Carbon monoxide (CO), resulting from incomplete oxidation of fuel-bound carbon
- Sulphur dioxide (SO_2), resulting from oxidation of fuel bound sulphur
- Airborne particulate matter measured as particles of diameter less than 10 microns (PM_{10}) and as fine particles of diameter less than 2.5 microns ($PM_{2.5}$). Particulate emissions result from incomplete oxidation of fuel bound carbon; oxidation of fuel-bound sulphur to sulphate; and emission of residual

ash material within diesel. Concentrations of particulate matter as PM10 would be proportionally higher when the power station is operating on diesel fuel.

In addition, the incomplete oxidation of fuel-bound carbon would result in airborne emissions, in smaller concentrations, of volatile organic compounds (VOCs) (e.g. acrolein, benzene, formaldehyde) and polycyclic aromatic hydrocarbons (PAHs).

Emissions to air are discussed in further detail in relation to the Proposal's potential impacts on air quality, in Chapter 15.

2.5.6 Water use

Potable and demineralised water are required to operate the Proposal. A high level summary of water types and uses is provided in the following section.

Potable water

Potable water would be used for a range of services and systems at the Proposal including:

- Input to the demineralised water treatment plant for the production of demineralised water
- Inlet air / evaporative cooling for the gas turbines
- Supply to workshops
- Amenities and administration buildings, including kitchens, safety showers, eyewash facilities, etc.
- Make-up supply for the firefighting and emergency facilities
- Plant wash down
- Landscaping irrigation.

The potable water supply to the Proposal Site would be received via a new connection into the existing Hunter Water potable water infrastructure network.

Demineralised water

Demineralised water would be produced from an on-site demineralised water treatment plant which would be supplied with potable water via the potable water storage tank or directly from the incoming potable water electro-deionisation, or ion-exchange technology to 'polish' the water to produce demineralised water.

Demineralised water is used for wet compression/fogging for power augmentation, and is often applied during high ambient temperatures. The water is sprayed into the turbine inlet, to provide a cooling effect and to boost power output. Demineralised water is also used for water injection when firing the gas turbine on diesel fuel, to keep the NO_x emissions within the required limits. A small amount of demineralised water would also be required for gas turbine compressor washing.

The demineralised water treatment plant would have a backwash for regeneration (which corresponds to approximately 20 per cent of the demineralised water demand) which, as process wastewater, would be neutralised before being discharged to the trade waste discharge point.

Water consumption

The estimated water demand for operation of the Proposal is detailed in Chapter 14 (section 14.3.2), with estimated water demand broken down in Table 14.5 and Table 14.6. Water tanks on site will buffer out instantaneous water demands from the Hunter Water supply connection. Water demand will be dependent on the eventual gas turbine selected for the Proposal and would be refined during the detailed design process.

The maximum estimated annual water consumption based on a 10 per cent capacity factor for gas and two per cent capacity factor for diesel fuel in any given year is estimated to be approximately 80 ML per annum. This will again be dependent on the eventual gas turbine selected for the Proposal and would be refined during the detailed design process. Consumption of up to about 235 megalitres of water could occur in 2025 if the turbines operate on diesel fuel throughout the entire year.

2.5.7 Wastewater

The Proposal would generate wastewater streams from the operation of the Proposal, including but not necessarily limited to the following:

- Gas turbine compressor wash water
- Gas turbine evaporative cooler water blowdown
- Auxiliary closed-circuit cooling water systems (drain down events for maintenance only)
- Demineralised water treatment plant regeneration wastewater
- Chemical bund drains
- Oily water drains collected from diesel fuel storage and unloading bunds, transformer bunds and workshops.

On-site oily water separators will be utilised for any dirty or contaminated stormwater areas on the Proposal Site and for any process streams such as the gas turbine compressor wash water that could be in contact with surfaces subject to diesel fuel.

The control, treatment and disposal of wastewater streams is discussed in further detail in relation to the proposed procedures for management of waste materials in Chapter 20.

2.5.8 Sewage

A new sewage reticulation system to service the Proposal Site would be constructed on the Site and will connect into the existing Hunter Water sewer infrastructure network via a new connection.

Appendix B. Revised greenhouse gas emission calculations

Emissions developed for the assessment of greenhouse gas emissions have been derived from a number of inputs and factors. This appendix aims to provide a summary of the data used to develop the emissions to provide a better understanding of how the emissions were estimated.

Note that the tables presented are for summary only. The calculated values in the table have been rounded to the nearest integer and hence have lost some complexity (i.e. the values down to the decimal places). As such, attempting to reproduce the results using the data only in the table may produce different and less accurate results than those presented.

B.1 Turbine emissions

The primary source of Scope 1 (i.e. direct) emissions from the project are the emissions from the operation of the turbines at full load. In order to develop the emissions related to the turbines, as well as calculate fuel consumption, the annual electricity production of the facility has been calculated. This can be performed utilising the proposed annual operating hours for the turbines alongside the electrical output of the whole plant, as detailed in the *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021). The calculated annual electrical production is displayed in **Table B.1**. The notes under the table detail the sources of the inputs utilised.

Table B.1 Annual energy output from turbine full load operation

Turbine fuel	Electrical output (MW)			Annual hours of operation	Annual electrical production from operation (MWh)		
	Gross[1]	Net[1]	Auxiliary[1]		Gross	Net	Auxiliary
Updated EIS First Year							
Diesel – Months 1 to 6	584.4	582.1	2.3	100[2]	58,440	58,210	230
Natural gas – Months 6 to 12	751.2	750.1	1.1	462.5[3]	347,430	346,921	509
Diesel – Months 6 to 12	584.4	582.1	2.3	75[3]	43,830	43,658	173
Modification 3 First Year							
Diesel	584.4	582.1	2.3	1,100[4]	642,840	640,310	2,530

Note 1: Plant power output based on Table 3.1 of *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021). Values represent simultaneous operation of both turbine units (i.e. individual turbine output is represented by half the displayed values).

Note 2: Assumed hours for commissioning and first six months of operation on diesel provided by a Project mechanical engineer.

Note 3: Assumed hours for last six months of operation during EIS/Response to submissions Stage was based on Table 2.1 of *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021) – 438 hours on natural gas and 87.5 hours on diesel (876 hours on natural gas and 175 hours on diesel annually). However, Condition of Approval A8 increased the allowable hours to 1,100 annually, while Condition of Approval A9 restricted allowable hours on diesel to 175 hours. In order for the assessment to be aligned with the conditions of approval, annual hours were revised to 925 hours on natural gas and 175 hours on diesel. Hence the hours for last six months of operation were revised to 462.5 hours on natural gas and 75 hours on diesel (in order to not exceed the annual 175 hours on diesel in combination with the 100 hours on diesel in the first six months).

Note 4: Assumed hours for modification based on the maximum allowable hours (1,100 hours based on condition of approval A8), solely on diesel (the basis of the modification).

In addition to full load operation detailed above, the start-ups of the turbines would also produce electricity associated with Scope 1 emissions. The overall annual electricity production associated with start-ups have been calculated utilising the overall number of start-ups and have been displayed in **Table B.2**. The notes under the table details the sources of the inputs utilised.

Table B.2 Annual energy output from turbine start-ups

Turbine fuel	Electrical output (MW)			Number of starts[2,3]	Annual electrical production from start-ups (MWh)		
	Gross[1]	Net[1]	Auxiliary[1]		Gross	Net	Auxiliary[5]
Updated EIS First Year							
Diesel – Months 1 to 6	584.4	582.1	2.3	25[4]	4,409	4,275	134
Natural gas – Months 6 to 12	751.2	750.1	1.1	21[4]	4,732	4,627	105

Turbine fuel	Electrical output (MW)			Number of starts[2,3]	Annual electrical production from start-ups (MWh)		
Diesel – Months 6 to 12	584.4	582.1	2.3	4[4]	705	684	21
Modification 3 First Year							
Diesel	584.4	582.1	2.3	50	8,817	8,550	268

Note 1: Plant power output based on Table 3.1 of *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021). Values represent both simultaneous operation of both turbine units (i.e. individual turbine output is represented by half the displayed values).

Note 2: 50 starts per year was adopted based on the average annual starts provided in Table 3.1 of *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021).

Note 3: Starts are assumed to initially be 25% load, increasing by 10% every 3 minutes up to 100% load after 30 minutes.

Note 4: Number of starts assumed to be split equally between the first and last six months. Starts on natural gas and diesel assumed to proportional based on operating hours on each fuel.

Note 5: Auxiliary load includes a sitewide auxiliary load of 4.675 MWh per start as per Table 9.2 of *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021).

In order to simplify fuel consumption and greenhouse gas emissions calculations, the annual electrical production from full load operation and start-ups were combined into an overall annual electrical production. This is displayed in **Table B.3**.

Table B.3 Total annual energy output from turbines

Turbine fuel	Annual electrical production from operation (MWh)			Annual electrical production from start-ups (MWh)			Annual overall production (MWh)		
	Gross	Net	Auxiliary	Gross	Net	Auxiliary	Gross	Net	Auxiliary
Updated EIS First Year									
Diesel – Months 1 to 6	58,440	58,210	230	4,409	4,275	134	62,849	62,485	364
Natural gas – Months 6 to 12	347,430	346,921	509	4,732	4,627	105	352,162	351,548	614
Diesel – Months 6 to 12	43,830	43,658	173	705	684	21	44,535	44,342	194
Modification 3 First Year									
Diesel	642,840	640,310	2,530	8,817	8,550	268	651,657	648,860	2,798

Utilising the overall gross annual electrical production and the plant heat rate values provided by a Project mechanical engineer, the electrical production can be displayed in gigajoules, which can then be used to calculate the equivalent fuel quantity utilising energy content factors provided in the *Australian National Greenhouse Accounts Factors 2023* (Department of Climate Change, Energy, the Environment and Water, 2023). The calculated annual energy production, in gigajoules, as well as the calculated annual fuel requirements have been calculated and displayed in **Table B.4**.

Table B.4 Annual fuel consumption associated with turbine operation

Turbine fuel	Annual gross electrical production (MWh)	Plant heat rate (HHV) (kJ/kWh)[1]	Annual gross energy production (GJ)	Energy content factor (GJ/kL)	Annual fuel requirements
Updated EIS First Year					
Diesel – Months 1 to 6	62,849	9,897	622,013	38.6[2]	16,114 kL
Natural gas – Months 6 to 12	352,162	9,572	3,371,033	0.0393[3]	85,776,926 m^3
Diesel – Months 6 to 12	44,535	9,897	440,767	38.6[2]	11,419 kL
Modification 3 First Year					

Turbine fuel	Annual gross electrical production (MWh)	Plant heat rate (HHV) (kJ/kWh)[1]	Annual gross energy production (GJ)	Energy content factor (GJ/kL)	Annual fuel requirements
Diesel	651,658	9,897	6,449,458	38.6[2]	167,084 kL

Note 1: Plant heat rates for the fuel types were provided by a Project mechanical engineer.

Note 2: Energy content factor provided in Table 8 of *Australian National Greenhouse Accounts Factors 2023* (Department of Climate Change, Energy, the Environment and Water, 2023).

Note 3: Energy content factor provided in Table 5 of *Australian National Greenhouse Accounts Factors 2023* (Department of Climate Change, Energy, the Environment and Water, 2023).

The gigajoules calculated in **Table B.4** can also be used in conjunction with emissions factors derived from the *Australian National Greenhouse Accounts Factors 2023* (Department of Climate Change, Energy, the Environment and Water, 2023) to develop the emissions associated with the operation of the turbines. The calculated Scope 1 (direct emissions, emitted from the site when combusted) and Scope 3 (indirect emissions, those not emitted from the site but are associated with the production and transport of the fuel combusted) emissions are displayed in **Table B.5**.

Table B.5 Annual greenhouse gas emissions associated with turbine operation

Turbine fuel	Annual gross energy production (GJ)	Emissions factors (t CO_2e / GJ)[1]					Annual emissions (t CO_2e)				
		Scope 1 (CO_2)	Scope 1 (CH_4)	Scope 1 (N_2O)	Scope 1 (CO_2e)	Scope 3	Scope 1 (CO_2)	Scope 1 (CH_4)	Scope 1 (N_2O)	Scope 1 (CO_2e)	Scope 3
Updated EIS First Year											
Diesel – Months 1 to 6	622,013	0.0699[1]	0.0001[1]	0.0002[1]	0.0702[1]	0.0173[1]	43,479	62	124	43,665	10,761
Natural gas – Months 6 to 12	3,371,033	0.0514[2]	0.0001[2]	0.00003[2]	0.05153[2]	0.014[3]	173,271	337	101	173,709	47,194
Diesel – Months 6 to 12	440,767	0.0699[1]	0.0001[1]	0.0002[1]	0.0702[1]	0.0173[1]	30,810	44	88	30,942	7,625
Modification 3 First Year											
Diesel	6,449,458	0.0699[1]	0.0001[1]	0.0002[1]	0.0702[1]	0.0173[1]	450,817	645	1,290	452,752	111,576

Note 1: Emission factors derived from Table 8 of *Australian National Greenhouse Accounts Factors 2023* (Department of Climate Change, Energy, the Environment and Water, 2023).

Note 2: Emission factor derived from Table 5 of *Australian National Greenhouse Accounts Factors 2023* (Department of Climate Change, Energy, the Environment and Water, 2023).

Note 3: Emission factor derived from Table 6 of *Australian National Greenhouse Accounts Factors 2023* (Department of Climate Change, Energy, the Environment and Water, 2023).

B.2 Other energy consumption

The annual fuel consumption requirements associated the backup generators were provided in the *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021). As with the turbine emissions, factors derived from the *Australian National Greenhouse Accounts Factors 2023* (Department of Climate Change, Energy, the Environment and Water, 2023) have been used to develop the annual Scope 1 and Scope 3 emissions associated with the operation of the generator. These are displayed in **Table B.6**.

Table B.6 Annual greenhouse gas emissions associated with backup generator

Generator fuel	Annual fuel consumption (kL)	Emissions factors (t CO_2e / kL)[2]					Annual emissions (t CO_2e)				
		Scope 1 (CO_2)	Scope 1 (CH_4)	Scope 1 (N_2O)	Scope 1 (CO_2e)	Scope 3	Scope 1 (CO_2)	Scope 1 (CH_4)	Scope 1 (N_2O)	Scope 1 (CO_2e)	Scope 3
Updated EIS First Year											
Diesel	9.6[1]	2.69814	0.00386	0.00772	2.70972	0.66778	26	0	0	26	6
Modification 3 First Year											
Diesel	9.6[1]	2.69814	0.00386	0.00772	2.70972	0.66778	26	0	0	26	6

Note 1: Annual backup generator fuel requirements based on Table 9.2 of *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021).

Note 2: Emission factors derived from Table 8 of *Australian National Greenhouse Accounts Factors 2023* (Department of Climate Change, Energy, the Environment and Water, 2023).

The annual grid energy consumption estimates were also provided in the *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021). Emission factors derived from the *Australian National Greenhouse Accounts Factors 2023* (Department of Climate Change, Energy, the Environment and Water, 2023) have been used to develop the annual Scope 2 (indirect emissions associated with the consumption of electricity produced outside the facility) and Scope 3 (indirect emissions, such as those associated with electrical distribution) emissions associated with grid electricity consumption. These are displayed in **Table B.7**.

Table B.7 Annual greenhouse gas emissions associated with grid electricity consumption

Electricity consumption	Annual electricity usage (MWh)	Emissions factors (t CO_2e / MWh)[3]		Emissions (t CO_2e)	
		Scope 1	Scope 3	Scope 1	Scope 3
Updated EIS First Year					
Grid	578[1]	0.68[2]	0.05[2]	393	29
Modification 3 First Year					
Grid	578[1]	0.68[2]	0.05[2]	393	29

Note 1: Annual grid energy requirements based on Table 9.2 of *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021).

Note 2: Emission factors derived from Table 1 of *Australian National Greenhouse Accounts Factors 2023* (Department of Climate Change, Energy, the Environment and Water, 2023).

B.3 Haulage of material

Haulage requirements for diesel were developed based on the previously calculated annual diesel combustion quantities within **Table B.4** and **Table B.6**. Other haulage requirements (annual importation of lube oil and annual waste production) were provided in the *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021). The *UK Government GHG Conversion Factors for Company Reporting 2024* (Department for Energy Security & Net Zero and Department for Environment Food & Rural Affairs, 2024) provides emission factors for the transportation of input material and waste off-site, which were used to develop Scope 3 (indirect emissions, associated with transportation of material) emissions associated with these movements. These were provided in **Table B.8**.

Table B.8 Annual greenhouse gas emissions associated with haulage of material to and from site

Haulage	Direction	Annual quantities	Assumed delivery details	Annual movements	Scope 3 emissions factors[4]	Scope 3 emissions (t CO_2e)
Updated EIS First Year						
Delivery of material	To site	Diesel - 27,543kL (~23,411t)[1] Lube Oil - 3kL (~2.6t)[2]	~40kL (35t) truck) 40km trip from Port of Newcastle	936,560 t.km	0.00005789 t CO_2e/ t.km	54
	From site	Nil – empty return		26,759 km	0.00063238 t CO_2e/ km	17
Disposal of waste	From site	Oily waste - 0.5t[3] Packaging - 1t[3] Mech waste - 10t[3] Electrical waste - 0.5t[3] Landscaping waste - 1t[3] Solid waste - 1.26t[3]	35t truck 15km trip to Cessnock	214 t.km	0.00005789 t CO_2e/ t.km	<1
	To site	Nil – empty arrival		15 km	0.00063238 t CO_2e/ km	<1
Modification 3 First Year						
Delivery of material	To site	Diesel - 167,094kL (~142,030t)[1] Lube Oil - 3kL (~2.6t)[2]	~40kL (35t) truck) 40km trip from Port of Newcastle	5,681,302 t.km	0.00005789 t CO_2e/ t.km	329
	From site	Nil – empty return		162,323 km	0.00063238 t CO_2e/ km	103
Disposal of waste	From site	Oily waste - 0.5t[3] Packaging - 1t[3] Mech waste - 10t[3] Electrical waste - 0.5t[3] Landscaping waste - 1t[3] Solid waste - 1.26t[3]	35t truck 15km trip to Cessnock	214 t.km	0.00005789 t CO_2e/ t.km	<1
	To site	Nil – empty arrival		15 km	0.00063238 t CO_2e/ km	<1

Note 1: Annual diesel quantities calculated from diesel requirements as described in Table B.4 and Table B.5.

Note 2: Annual lube oil quantities based on Table 9.2 of *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021).

Note 3: Annual waste quantities based on Table 9.2 of *Kurri Kurri Power Station Development Basis of Design* (Jacobs, 2021).

Note 4: Emission factors derived from the 'Freighting Goods' sheet within the *UK Government GHG Conversion Factors for Company Reporting 2024* (Department for Energy Security & Net Zero and Department for Environment Food & Rural Affairs, 2024).