Government of Western Australia
Department of Water and Environmental Regulation

Amendment Report

Licence Number	L8815/2004/2
Licence Holder	EDL NGD (WA) Pty Ltd
ACN	070 941 721
FFile Number:	DER2015/001548
Premises	Broome Power Station Part of Lot 1049 on Plan 213567 2 – 4 McDaniel Road MINYIRR WA 6725
Date of Report	19 May 2020
Decision	**Licence Amended**

1. Definitions and interpretation

Definitions

In this Amendment Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
Amendment Report	refers to this document
Category/ Categories/ Cat.	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CEO	means Chief Executive Officer of the Department of Water and Environmental Regulation
CO	Carbon Monoxide
Delegated Officer	an officer under section 20 of the EP Act
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
EP Noise Regulations	*Environmental Protection (Noise) Regulations 1997* (WA)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of and during this amendment
Licence Holder	EDL NGD (WA) Pty Ltd
m^3	cubic metres
Nm^3/min	Normal cubic metres per minute
NO_2	Nitrogen dioxide
NOx	oxides of nitrogen
NEPM	National Environmental Protection Measure
Occupier	has the same meaning given to that term under the EP Act.
PM	Particulate Matter

$PM_{2.5}$	used to described particulate matter that is smaller than 2.5 microns (µm) in diameter
PM_{10}	used to describe particulate matter that is smaller than 10 microns (µm) in diameter.
Peak Shaving	means a Prime Generator used during peak times of usage to allow load management of electricity supplied
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Amendment Report applies, as specified at the front of this Amendment Report.
Prime Generator	means a generator used as a Premises main source of continuous power
Revised Licence	the amended Licence issued under Part V, Division 3 of the EP Act, with changes that correspond to the assessment outlined in this Amendment Report.
Risk Event	as described in *Guidance Statement: Risk Assessment*
SOx	oxides of sulphur
VOCs	Volatile organic compounds

2. Application details

A licence amendment application was received from the Licence Holder to amend Existing Licence L81552004/2 for the Broome Power Station (the Premises). The amendment application has been requested to incorporate an update to the Premises boundary and layout, and include the addition of three new diesel engine generators to be operated in times of peak power demand, increasing the Premises design capacity for electric power generation from 34MW to 37MW. The amendment application also reviews available emergency standby generators on the Premises and incorporates them on the Revised Licence.

This amendment is made pursuant to section 59(2) of the EP Act to amend Licence L8155/2004/2 granted to the Licence Holder for operation of the Premises.

Table 2 lists the documents submitted during the assessment process.

Table 2: Documents and information submitted during the assessment process

Document/information description	Date received	DWER reference number
Application to amend licence Form – L8155 Broome Power Station. Including Attachment 2: Premises Maps: • Layout map showing emission sources; and • Aerial picture showing new boundary	1 August 2019	DWERDT184936
Subsequent replacement Premises Map: • Emission sources	15 August 2019	A1814930

2.2 Purpose and scope of assessment

This licence amendment:

1. records the required change to the Premises boundary and site layout to reflect to changes in contractual agreements between the Licence Holder and Horizon Power (landowner). This Premises boundary change requires moving of transformers and switchboard control within the Premises;
2. provides additional regulatory controls in the Revised Licence to ensure that the existing emergency standby diesel generators on the Premises are recorded as emission points to air; and
3. undertakes a risk based assessment of emissions to air associated with the proposed operation of three new CAT3512 diesel engines to be used as Peak Shaving generators for approximately 32 hours per month (no more than 224 hours in total) from October 2020 to April 2021 (inclusive).

Table 3 below outlines the proposed changes to the Licence.

Table 3: Proposed design capacity changes

Category	Current design capacity	Proposed design capacity	Description of proposed amendment
52 Electric power generation	34MW	37MW	Update to Premises boundary and layout, incorporation of emergency standby generators and inclusion of three additional diesel engines as Peak Shaving generators (in addition to also being used as

			emergency standby generators).

The Licence Holder has informed DWER of the requirement to update the Premises boundary and has provided an updated Premises boundary map. This is an administrative amendment and as such, the Premises boundary has been amended in the Revised Licence.

The Licence Holder has also requested approval to change the configuration of the standby diesel generation stations at the Premises, by removing three emergency standby diesel engines and replacing them with two 1,250MTU.kVA diesel engines of slightly higher capacity from the Horizon Power fleet (old Broome Power Station). The Premises also has 4 Cummins emergency standby diesel generators located at 'D Station'. The Existing Licence currently does not include the emergency standby diesel generators as approved emission sources and as such, this amendment will capture the existing emergency standby diesel generators onsite. Emergency standby generators that are not used as Prime Generators on power stations do not meet the definition of Category 52: Electric power generation in accordance with Schedule 1 of the EP Regulations. As such, an assessment of emissions and discharges is not required, however the exhaust stacks from these generators will be included as approved emission points on Licence L8155/2004/2.

Section 8 reviews the emissions and discharges from the three CAT3512 diesel generators proposed for Peak Shaving use at the Premises (in addition to operating them during emergency scenarios).

3. Premises Background

The Premises is located at Lot 1049 McDaniel Road in the Shire of Broome's Industrial zone to the south of the Broome town site (see Figure 1).

Works Approval W4064/2004/1 was issued to the Licence Holder in February 2005 approving construction of 25 individual Caterpillar G3520 C natural gas powered internal combustion engines (radiator cooled reciprocating engines) with a nominal design capacity of 50MW. The gas-fired power station was constructed to replace the previous diesel fired Broome Power Station operated by Western Power. To date, 17 gas powered Liquefied Natural Gas (LNG) engines have been constructed at the Premises.

Existing Licence L8155/2004/1 was issued on 18 June 2007 and approved the operation of:

- 17 Caterpillar G3520 C natural gas powered internal combustion engines;
- Diesel, oil and glycol storage areas and associated unloading and transfer infrastructure; and
- Other infrastructure such as transformer stations, utilities, office buildings and stormwater runoff collection and treatment.

4. Overview of Premises

4.1 Operational aspects

The generation of electricity at the Premises is predominantly supplied from the gas generators using LNG from the Maitland LNG Facility in Karratha. The LNG is transported by road to various power stations (including Broome Power Station) in the West Kimberley.

Natural gas is supplied to the BPS via a gas pipeline from the LNG bulk fuel storage facility in Broome, located approximately 11km north north-east of the power station. Diesel is supplied to diesel generators via a bulk 610m^3 tank located on the Premises.

As a contingency, in the event that the continuous supply of LNG to the power station is interrupted, Liquefied Propane Gas (LPG) can be used to fuel the Caterpillar G3520 C

generators until such time LNG is available. The Caterpillar G3520 C generators will operate at reduced load when fuelled by LPG owing to the different fuel characteristics between natural gas and LPG.

In the event that the LPG fuelled generators are unable to satisfy demand, diesel fuelled generators are available on the Premises to supplement the power generation and meet energy demands from the Broome community. These emergency diesel generators have been made available from Western Power's old diesel-fired power station located adjacent to the Premises.

The Broome Power Station infrastructure, as it relates to Category 52 activities in the Revised Licence, is detailed in Table 4 and with reference to the Premises layout below.

Table 4: Broome Power Station category 52 infrastructure

	Infrastructure	**Site Plan Reference** Schedule 1: Premises layout
Prescribed Activity Category 52		
37 MW electric power generation; gas and diesel fuelled		
1.	Gas Station: 17 x 1.85 MW Caterpillar G3520 C natural gas-powered radiator cooled reciprocating engines (original) of combined capacity 34 MW	GM01 – GM17
2.	C Station: • 3 x diesel CAT3512 engines of combined capacity 3 MW (proposed for Peak Shaving operations); and • 2 x 1,250 MTU kVA diesel engines of combined capacity 2.5 MW (emergency standby generators)	F1 – F3; and C1 – C2
3.	D Station (emergency standby generators): 4 x Cummins 0.9 MW diesel fuelled generators of combined capacity 3.6 MW	D5 – D8
4.	Hydrocarbon (diesel, oil) and glycol bunded storage areas (bulk and day storage tanks): Tank #1: diesel tank – 55kL Tank #5: Bulk diesel tank – 610kL Tank #7: diesel tank – 16kL 5 x 1kL diesel tanks (day storage)	Diesel storage tanks #1, #5 and #7
5.	Stormwater treatment system, comprising oily water separator for treatment prior to discharge to land	Oily water separator and discharge
6.	Switchroom, transformer units, administration buildings, workshops	Not shown

5. Use of Peak Shaving generators

The Licence Holder is seeking approval to operate (as Prime Generators for the purpose of Peak Shaving) three new CAT3512 diesel engines with a combined capacity of 3 MW. In addition to operating them as emergency standby generators, the Licence Holder proposes to operate the three CAT3512 diesel engines intermittently during high electricity demand periods (summer months) to cater for peak demand. The estimated running times for these engines is approximately 32 hours per month during October to April (no more than 224 hours in total).

Previously, these engines were only connected to the existing station on an emergency basis. These engines will be relocated within the Premises 'C Station' and will utilise existing diesel tank storage infrastructure as their fuel source. The exhaust points for emissions from the CAT3512 diesel engines are located 3m above ground level (AGL).

The proposal to intermittently operate three CAT3512 diesel engines at C Station as Prime Generators may result in a change to the emissions risk profile, and as such, requires an assessment of emissions and discharges in accordance with DWER's published Regulatory Framework (Table 11).

No significant emissions are expected from the construction (reconfiguration and installation of generators) works, which will only take a few weeks. The diesel engine bays are located within an existing shed on concrete flooring, with sufficient closed drainage control systems in place to prevent any discharges of hydrocarbons or coolants to land. Noise emissions are expected to be negligible. The Delegated Officer considers the general provisions of the EP Act, as well as the EP Noise Regulations are sufficient to manage any potential emissions during the reconfiguration and installation works.

5.1 Air Quality Impact Assessment

The Licence Holder conducted an Air Quality Impact Assessment (AQIA) in August 2004 as part of the original works approval and licence applications for the Premises, to predict compliance with the National Environmental Protection Council's National Environmental Protection Measure for Ambient Air Quality (1998) (Ambient Air NEPM). The AQIA predicted ground level concentrations (GLCs) for air pollutants Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Particulates as PM_{10}, and Sulfur Dioxide (SO_2) and assumed continuous operation of 25 gas engine units with nominal capacity of 50MW, operating 24 hours per day for 365 days of the year at full load, based on an anticipated capacity of the Premises in the year 2025.

In the absence of any background air quality data for Broome, the AQIA incorporated background air quality concentrations taken from King Bay (Dampier) and Bunbury. The AQIA was considered conservative as both King Bay and Bunbury had significantly higher levels of industrial activity than Broome at that time, and the assumed continuous operation of 25 gas engine units operating 24 hours per day all year round was not reflective of actual expected operating levels.

Dispersion modelling for the Broome Power Station at these operating levels was conducted using the CALPUFF dispersion model, coupled with a three dimensional prognostic meteorological model (TAPM) and a meteorological processor (CALMET), to simulate three dimensional transport, and small scale local variations in meteorological parameters.

The predicted GLCs of all modelled pollutants demonstrated compliance with the Ambient Air NEPM guidelines for the modelled scenario, as can be seen in Table 5 below.

Table 5: Broome Power Station – results of air dispersion modelling (25 gas engine units at 50MW, operating 24 hours per day, 365 days per year at full load)

Parameter	Averaging period	NEPM goal (µg/m^3)	Range at receptors D1 to D10 (µg/m^3)	Maximum GLC	
				(µg/m^3)	% NEPM
CO	8 hours	11,247	2,545 – 3,277	3,277	29%
NO_2	1 hour	246	128 - 192	192	84%
	Annual	62	20 – 24	30	48%
PM_{10}	24 hours	50	0.1 – 2	2	4%

SO_2	1 hour	270	85 – 86	86	15%
	24 hours	228	7.5 – 8	8	4%
	Annual	57	0.001 – 0.08	0.08	0.1%

As can be seen from the above modelling, the pollutant of most significance from the Premises is NO_2, for which the maximum (1 hour) GLC was predicted to approximate 84% of the NEPM guideline.

In considering the Application to amend the current Premises licence to incorporate operation of three diesel engines as Peak Shaving generators, the Delegated Officer notes the conservative nature of the above modelling, based on the scenario of 25 gas engine units operating at full load all year round. The present configuration of the gas power station includes only 17 gas engine units that operate according to demand placed on the electricity grid, which varies according to the time of day and time of year.

5.2 Emissions from CAT3512 diesel engines

A comparison of typical pollutant emissions from the CAT3512 diesel engines and the CATG3520 C natural gas engines is shown in Table 6 below.

Table 6: Comparison of diesel engine and gas engine emissions (various sources)

Parameter	Units	CAT3512 diesel engine	CATG3520 C natural gas engine
NOx	mg/m^3	3,501.8[1, 2]	500[1, 3]
CO		919.2[1, 2]	1,076[1, 3]
SO_2		0.0010484[4]	5.595[5]
VOC		80.2[4]	<0.625[6]
PM_{10}		Not available	1.815[5]
Exhaust flow rate	Nm^3/min	90.84	152

1. Based on manufacturer's specifications.
2. Engines operating on prime output available with varying load for an unlimited time. Average power output is 70% of the prime power rating.
3. Continuous - Maximum output available for an unlimited time
4. Calculated using NPI emission factors.
5. Average actual emission rate based on stack testing performed on 4 gas engine units in August 2018.
6. Average actual emission rate based on stack testing performed on 1 gas engine unit in August 2018.

As can be seen in Table 6, the CAT3512 diesel engine can emit NOx concentrations at up to 6 times the rate of the gas engine, and VOC emissions at up to 80 times the rate of the gas engine. Consequently, the impact of using diesel generators for Peak Shaving to meet electricity demand on ambient NO_2 and VOC concentrations is expected to be potentially significant.

In addition, it is likely that ambient concentrations during non-routine upset conditions (e.g. cold start or shutdown) would be significantly higher than during normal operation conditions.

Advice was sought from DWER's Air Quality Services (AQS) branch on the proposal to operate the three diesel generators for up to 32 hours per month from October to April. Advice received was that operation of the diesel engines in addition to the 17 gas generators has the potential to result in exceedances of the NEPM NO_2 hourly criterion at sensitive receptor locations. The likelihood of this occurring would depend upon the frequency of operation of the diesel units and the meteorological conditions at those times.

DWER's AQS advised that installation of additional gas fuelled generators (Caterpillar G3520 C) as proposed in Works Approval W4064/2004/1 is the better option for meeting near future energy demands of Broome.

6. Legislative context

Table 7 summarises approvals relevant to the assessment.

Table 7: Relevant approvals

Legislation	Number	Approval
Planning and Development Act 2005	Not Required	The Licence Holder advised in the Application that consultation with the Shire of Broome occurred. No Development Approval is required for changes proposed as the engines will be installed within existing concrete slabs. The Planning Approval advice for the additional diesel generators was received from the Shire of Broome on 5 July 2019
Dangerous Goods Safety Act 2004	Dangerous Goods Licence DGS010279	The Dangerous Goods Storage licence for the Premises was issued by the then Department of Mines and Petroleum (now DMIRS) on 23 June 2016

6.2 Planning approvals

The Shire of Broome (the Shire) was consulted on 28 August 2019 to seek comment on the Application. No comments were received from the Shire.

6.3 Part V of the EP Act

6.3.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

The guidance statements which inform this assessment are outlined in Appendix 1.

6.3.2 Works approval and licence history

Table 8 summarises the works approval and licence history for the Premises.

Table 8: Broome Power Station Works Approval and Licence history

Instrument	Issued	Amendment
W4064/2004/1	2 February 2005	Approved construction of 34MW gas fired power station (17 Caterpillar G3520 C generators) with diesel backup units (seven Cummins 0.9MW diesel fueled generators)
L8155/2004/1	18/6/2007	Approved operation of 34MW gas fired power station constructed under W4064/2004/1
L8155/2004/2	18/6/2012	Licence reissue
L8155/2004/2	19 May 2020	Licence Holder initiated Licence amendment to update Premises boundary, assess operation of three new CAT3512 engines during high electricity demand periods (summer months), and incorporate exiting standby diesel generators on the Premises.

7. Location and receptors

Table 9 below lists the relevant sensitive land uses in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 9: Receptors and distance from premises boundary

Residential and sensitive premises	Distance from Prescribed Premises
Accommodation units	550m east of Premises boundary
Residential areas	800m to the north and west of the Premises boundary

Table 10 below lists the relevant environmental receptors in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 10: Environmental receptors and distance from activity boundary

Environmental receptors	Distance from Prescribed Premises
Ramsar wetland: Roebuck Bay	1.2km east of the Premises boundary
ANCA Wetland: Dampier Creek	6km to the northeast of the Premises boundary
Environmentally Sensitive area (declared rare fauna)	2km south of the Premises boundary

8. Risk assessment

Table 11 below describes the Risk Events associated with the amendment consistent with the *Guidance Statement: Risk Assessments*. Table 11 identifies whether the emissions during operations present a material risk to public health or the environment, requiring regulatory controls.

Table 11: Risk assessment for proposed amendments during operation

Risk Event				Consequence rating[1]	Likelihood rating[1]	Risk[1]	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/Activities*	**Potential emissions**	**Potential receptors, pathway and impact**	**Applicant controls**					
Operation of 3 x additional diesel engine generators during peak demand times	Discharge to air: combustion gases (NOx, SOx, VOCs, CO)	Air/windborne pathway causing impacts to health and amenity of closest sensitive receptors located 550m east and 800m north and west of the Premises	Operation will be for not more than 224 hours during the period October 2020 to April 2021.	Moderate	Possible	Medium	The Delegated Officer notes the high emission rates of NOx from the diesel generators (compared to the gas engines) and the uncertainty with regard to meeting the Ambient Air NEPM criteria while diesel engines are operating.	The Delegated Officer has approved the use of the additional diesel generators for no more than 224 hours during the period from October 2020 to April 2021. This will give the Licence Holder time to either demonstrate compliance with the Ambient Air NEPM criteria or plan for other options to meet electricity demand.
	Noise emissions from generators when running	Air/windborne pathway causing impacts to health and amenity of closest noise sensitive receptors located approximately 550m east and 800m north and west of the Premises	Operation will be for not more than 224 hours during the period October 2020 to April 2021.	Moderate	Rare	Medium	The additional diesel generators are expected to emit similar sound power levels as the existing gas generators, therefore, noise levels are not expected to be considerably different to that already emitted from the Premises.	No conditions required. The EP Noise Regulations apply at all times during operations.
	Spills/leaks of hydrocarbons associated with operation of diesel	Overland runoff causing impacts to flora, surface water and threatened fauna	Diesel generators located within shed on concrete bunded floor. Diesel day tanks located on concrete	Minor	Rare	Low	The existing stormwater mitigation controls on the Premises are likely to be	No conditions required. Existing Licence contains Conditions requiring hydrocarbon

Risk Event				Consequence rating[1]	Likelihood rating[1]	Risk[1]	Reasoning	Regulatory controls (refer to conditions of the granted instrument)
Source/Activities*	Potential emissions	Potential receptors, pathway and impact	Applicant controls					
	generators; stormwater potentially contaminated with hydrocarbons	from the discharge of hydrocarbons and / or sediment into the environment.	bunded areas. Drainage systems constructed onsite divert uncontaminated stormwater away from operational areas. Potentially contaminated stormwater from sumps and bunds is treated through the Premises Oily Water Separator prior to being discharged to an onsite sump for infiltration. Sediments will be contained in this sump.				sufficient at mitigating potential hydrocarbon / contaminated stormwater emissions from operation of the diesel generators.	contaminated stormwater generated on the Premises to be directed to the Oily Water Separator System prior to discharge to an infiltration sump. The Licence also specifies a treated stormwater discharge limit of ≤5mg/L TRH and associated annual sampling and analysis of discharge from Oily Water Separator System by a NATA accredited laboratory.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the Department's Guidance Statement: Risk Assessments (February 2017)

8.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 12 below.

Table 12: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 13 below.

Table 13: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	• **onsite impacts**: catastrophic • **offsite impacts local scale**: high level or above • **offsite impacts wider scale:** mid-level or above • Mid to long-term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • **Adverse health effects:** high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • **Local scale impacts:** permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	• **onsite impacts**: high level • **offsite impacts local scale**: mid-level • **offsite impacts wider scale**: low level • Short-term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• **Adverse health effects:** mid-level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • **Local scale impacts**: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	• **onsite impacts**: mid-level • **offsite impacts local scale**: low level • **offsite impacts wider scale**: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• **Adverse health effects:** low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • **Local scale impacts:** mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	• **onsite impacts**: low level • **offsite impacts local scale**: minimal • **offsite impacts wider scale**: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • **Local scale impacts:** low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	• **onsite impact**: minimal • Specific Consequence Criteria (for environment) met	• **Local scale**: minimal to amenity • Specific Consequence Criteria (for public health) met

^ Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting.*

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines.*

"onsite" means within the Prescribed Premises boundary.

8.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 14 below:

Table 14: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

8.4 Risk Assessment – exceedance of Ambient Air NEPM from combustion gases during operation of Peak Shaving diesel generators

8.4.1 Description of combustion gases from operation of Peak Shaving diesel generators

Combustion gases to be generated during operation of the CAT3512 diesel generators will include oxides of nitrogen (NOx), carbon monoxide (CO), sulfur dioxide (SO_2) and VOCs. These are common pollutants produced by power stations as a result of fuel combustion. The ratio and rate of combustion gases produced are dependent on fuel type and combustion efficiency.

8.4.2 Identification and general characterisation of emission

The emission specifications for the CAT3512 diesel engines are outlined in Table 12. As can be seen from Table 15, the emissions of most significance include NOx, CO and total VOCs.

Table 15: Emission specifications for CAT3512 diesel engines

Emission	Technical specification
NOx	3501.8 mg/Nm^3
CO	919.2 mg/Nm^3
SO2[1]	0.0010484 mg/Nm^3
Total VOC[1]	80.2 mg/Nm^3

1. Calculated using NPI emissions factors

Excessive carbon monoxide is generally indicative of incomplete combustion whereas excessive NOx is often the result of high or excessive combustion temperatures. NOx

emissions through combustion are also generated through nitrogen in fuels combining with excess oxygen in the air and to a lesser extent, atmospheric NOx reacting with radicals in the air. NOx emissions to air from combustion sources are mainly in the form of nitric oxide (NO) and nitrogen dioxide (NO_2).

8.4.3 Description of potential adverse impact from the emission

Short term exposure to increased levels of NOx and SO_2 may cause respiratory problems, particularly for people for with asthma. High levels of CO may affect the amount of oxygen carried in the blood stream.

Nitrogen dioxide

NO_2 can affect humans both directly and indirectly; directly, by irritation that leads to an inflammatory reaction in the lungs, and indirectly by affecting the immune system.

The short term effects of NO_2 are mainly associated with the respiratory system, generally in combination with other pollutants such as irritant gases and particulates. The effects include wheezing, cough, sputum production in asthmatics and people with chronic inflammatory lung disease. At higher concentrations it can contribute to illness (morbidity) and mortality of especially sensitive sub groups, such as children, asthmatics and people with chronic lung disease such as chronic bronchitis.

Oxides of nitrogen can react with VOCs in the presence of sunlight to form photochemical smog. NO_2 will dissolve in water to form nitrates and nitric acid.

Sulfur dioxide

SO_2 is a colourless, irritating and reactive gas with a strong odour. The odour is perceptible at different levels depending on the individual's sensitivity.

SO_2 is highly soluble in water and is quickly absorbed in the moist environment of the upper or lower airways of the respiratory tract, which it exerts its adverse effects. It cause causes a reduction in the diameter of airways and a reduction in airflow by acting on cells that cause inflammation, constriction and create mucus.

8.4.4 Criteria for assessment

The New South Wales (NSW) *Protection of the Environment Operations (Clean Air) Regulation 2010* (NSW Clean Air Regulations) specifies standard concentration rates for emissions from various plant and equipment in NSW. In the absence of similar regulations in Western Australia the NSW Clean Air Regulations are useful in providing a comparative review of emissions from the proposed Peak Shaving diesel generators.

For electricity generation the standard of concentration for relevant air pollutants as specified in the NSW Clean Air Regulations is outlined in Table 16, along with the emission rates from the proposed Peak Shaving diesel generators.

Table 16: NSW Clean Air Regulations: emission standards from for electricity generation NO_2, CO and VOCs compared with CAT3512 diesel generators

Pollutant	Concentration standard	CAT3512 diesel engines	CAT3512 diesel engines as a Percentage of NSW Clean Air Regs
NO_2	450mg/m^3	3501.8 mg/Nm^3 (as NOx)	3,891%
CO	125mg/m^3	919.2 mg/Nm^3	735%
VOCs	40mg/m^3	80.2 mg/Nm^3	200%

The Ambient Air NEPM sets ambient air quality standards for CO, NO_2 and SO_2 for the

protection of human health and well-being. These standards are outlined in Table 17.

Table 17: NEPM Ambient Air Quality standards for CO, NO_2 and SO_2

Pollutant	Maximum concentration standard	Averaging period	Maximum allowable exceedances
CO	9 ppm	8-hour	1 day a year
NO_2	0.12 ppm	1-hour	1 day a year
	0.03 ppm	1-year	None
SO_2	0.2 ppm	1-hour	1 day a year
	0.08 ppm	24-hour	1 day a year
	0.02 ppm	1-year	None

The Delegated Officer notes that while there is no modelling or monitoring data available to compare the cumulative ambient air concentrations from emissions during operation of gas generators and the CAT3512 diesel engines, it is assumed that the high emission intensity rates from the diesel generators contributes to an increased likelihood of exceedances of the NEPM NO_2 hourly criterion at sensitive receptor locations 550m east and 800m north and west of the Premises, particularly under certain meteorological conditions.

In addition, it is likely that ambient concentrations during non-routine upset conditions (e.g., cold start or shutdown) would be significantly higher than during normal operation conditions.

8.4.5 Licence Holder controls

The Licence Holder has committed to only using the diesel engines for Peak Shaving requirements to meet peak electricity demand during the summer months in Broome. This means only operating the diesel generators for up to 224 hours during the period from October 2020 to April 2021.

8.4.6 Consequence

If an exceedance of the Ambient Air NEPM occurs from operation of the Peak Shaving diesel generators, then the Delegated Officer has determined that the impact of exceeding the Ambient Air NEPM will be specific consequence criteria for public health are not met. Therefore, the Delegated Officer considers the consequence of exceeding the Ambient Air NEPM to be **moderate**.

8.4.7 Likelihood of Risk Event

The Delegated Officer has determined that an exceedance of the Ambient Air Quality NEPM could occur at some time. The Ambient Air Quality NEPM NO_2 guideline includes a short term (i.e. hourly) criteria, meaning that there is potential for exceedances should adverse meteorological conditions coincide with peak emissions over short periods. The diesel engines used for peak shaving will emit up to six times the NO_2 emissions that the gas generators emit. This could be equivalent to an additional nine gas generators operating. The original AQIA only modelled up to 25 gas generators operating.

Therefore, the Delegated Officer considers the likelihood of exceedance of the Ambient Air Quality NEPM to be **possible**.

8.4.8 Overall rating of exceedance of the Ambient Air Quality NEPM

The Delegated Officer has compared the consequence and likelihood ratings described above

with the risk rating matrix (Table 12) and determined that the overall rating for the risk of exceedance of the Ambient Air Quality NEPM is **Medium.**

9. Decision

The Delegated Officer notes that the Licence Holder has initially installed 17 gas generators (in 2007) approved under Works Approval W4064/2004/1 and that up to eight more gas generators were planned to be installed by 2025. The Delegated Officer also notes the relatively high emissions intensity (ratio of emissions to electricity generation) associated with the operation of the diesel generators. Given:

1. the close proximity of the power generators to sensitive receptors (residential, tourist accommodation and recreation locations);
2. the 2004 AQIA which predicted that NO_2 GLCs (modelling results) at sensitive receptors are significant, approaching 80% of the hourly criterion;
3. the three diesel generator proposed for peak load management emit significantly more pollution than the existing gas generators (approximately ten times greater than the existing gas generators); and
4. there is a high energy demand in the Broome region which is likely to grow in future years;

the Delegated Officer considers that long term operation of diesel generators as Peak Shaving generators is not feasible, in that there is a medium risk that the Ambient Air Quality NEPM criteria may not be met at nearby sensitive receptors during certain meteorological conditions.

The Delegated Officer has therefore imposed the following conditions as controls on the Amended Licence:

1. the Licence Holder may only use the CAT3512 diesel engines as Peak Shaving engines during summer months up to April 2021, which will give the Licence Holder sufficient time to either demonstrate compliance with the Ambient Air NEPM criteria during operation of the diesel engines, or plan for other options to meet increased electricity demand in Broome. Demonstration of compliance with the Ambient Air NEPM via monitoring of ambient air quality at the closest sensitive receptors may be considered by the Delegated Officer as part of a future Licence amendment application to extend the time limited approval to operate the CAT3512 diesel engines as Peak Shaving generators. It is however, the Delegated Officers recommendation that the Licence Holder install additional gas fueled generators (Caterpillar G3520 C) as originally proposed in the initial works approval and licence applications. It should be noted that further approvals from DWER for any option will be required in accordance with section 53 of the EP Act;
2. a limit has been applied to Existing Licence L8155/2004/2 approving the CAT3512 diesel generators to operate for no more than 224 hours between the period from October 2020 to April 2021;
3. the Licence Holder must report all operating hours and conditions when operating the CAT3512 diesel engines as Peak Shaving engines in the AER, and must notify DWER of any exceedance of these operating limits within 7 days of the exceedance occurring; and
4. the Licence Holder must use low Sulphur content diesel in the Peak Shaving diesel generators to ensure SOx emissions remain low.

The Delegated Officer has also authorised the update to the Premises boundary and the inclusion of existing emergency standby diesel generators on the Revised Licence.

10. Summary of amendments

Table 18 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Revised Licence as part of the amendment process, as well as additional regulatory controls imposed by the Delegated Officer.

Table 18: Licence amendments

Condition No.	Proposed amendments
1	Inclusion of all emergency standby diesel generators, as well as the three CAT3512 diesel engines as Peak Shaving generators as authorised infrastructure on the Premises. Also inclusion of hydrocarbon storage infrastructure and contaminated stormwater treatment system.
2	Authorisation of emission point sources associated with all emergency standby diesel generators, as well as the three CAT3512 diesel engines as Peak Shaving generators on the Premises.
4	Operational limits imposed for the three CAT3512 diesel engines when using them as Peak Shaving generators.
6	Monitoring of point source emissions to air associated with operation of the three CAT3512 diesel engines as Peak Shaving generators, at least once during the approved operational period to 30 April 2021
13	Non-compliance notification required within seven days of becoming aware of any non-compliance with operational limits specified in Condition 4.

11. Conclusion

The assessment of this application has been undertaken in accordance with DWER's published Regulatory Framework.

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a Licence amendment will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

The Amended Licence has been issued in a new format with existing conditions being transferred, but not reassessed, to the new format. The numbering, wording and format of existing conditions may have changed, but the intent remains the same.

The Amended Licence issued as a result of this amendment application supersedes all previously authorised licences issued in relation to the Premises. The Amended Licence has been issued in a new format with existing conditions being transferred, but not reassessed, to the new format.

Caron Goodbourn
MANAGER, PROCESS INDUSTRIES
INDUSTRY REGULATION

An officer delegated by the CEO under section 20 of the EP Act

Appendix 1: Key documents

	Document title	Availability
1	Licence L8155/2004/2 – Broome Power Station	accessed at www.dwer.wa.gov.au
2	Works Approval W4064/2004/1 –Broome Power Station	DWER records (NWK2185)
3	EDL LNG (WA) Pty Ltd Broome Power Station licence amendment application	DWER records (DWERDT184936)
4	DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth.	accessed at www.dwer.wa.gov.au
5	DER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth.	
6	DER, August 2016. *Guidance Statement: Licence duration.* Department of Environment Regulation, Perth.	
7	DER, November 2016. *Guidance Statement: Environmental Siting*. Department of Environment Regulation, Perth.	
8	DER, February 2017. *Guidance Statement: Risk Assessments.* Department of Environment Regulation, Perth.	
9	DWER, June 2019. *Guideline: Decision Making.* Department of Water and Environmental Regulation, Perth	
10	DER, November 2016. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth.	
11	*Environmental Protection (Noise) Regulations 1997*	www.slp.wa.gov.au
12	*New South Wales (NSW) Protection of the Environment Operations (Clean Air) Regulation 2010*	https://www.legislation.nsw.gov.au/#/view/regulation/2010/428

Appendix 2: Summary of Licence Holder comments

The Licence Holder was provided with the draft Amendment Report on 14 November 2019 for review and comment. The Licence Holder responded on 31 January 2020 and, after receiving a response from DWER dated 12 March 2020, provided further comments on 16 April 2020. Table 19 provides a summary of comments received on the draft amended licence and draft Amendment Report.

Table 19: Summary of Licence Holder comments on drafts

Condition of Licence or section of Amendment Report	Summary of Licence Holder comment	DWER response
Licence Holder response received on 31 January 2020		
Assessed design capacity	Refer to comments in EDL letter. EDL believes assessed design capacity should be 34 MW (for 17 x gas units only). Not 37 MW (which includes operation 3 x CAT diesel engines as peak load (prime) generators)	DWER has formed the view that the proposal to use 3 x diesel engines for around 32 hours/month from Nov-March during peak electricity demand times in summer represents the use of such engines as peak load management engines. This type of use is considered more of a routine operating scenario for that time of year rather than an emergency situation. That is, this type of operation is not 'reasonably unforeseen' and therefore not considered an emergency situation by DWER. The regular and routine operation of 3 x CAT diesel engines in this manner is therefore seen to being used as prime or peak shaving generators. Therefore, the Premises correct design capacity for category 52 activities when using the diesel engines in this manner is assessed as 37 MW.
Table 1, row 1	Please change number of stacks for gas generators from 11 stacks to 17 stacks (each gas generator has its own stack)	DWER notes the incorrect reference to stack numbers and agrees to this change.
Table 1, row 5	EDL notes: • The new requirement for transformers to be bunded in a manner compliant with AS1940; and • Discussions with C Standring acknowledging that this is a new structural requirement imposed on pre-existing infrastructure and that no assessment to confirm compliance with this standard has been completed. This will take some time. EDL requests the removal of the reference to AS1940 in Table 1	DWER notes that the reference to transformers being bunded in compliance with AS1940 is a new control imposed on existing infrastructure and therefore agrees to this change.

Condition of Licence or section of Amendment Report	Summary of Licence Holder comment	DWER response
	row 5.	
Table 1, Row 6	EDL notes: • The new requirement for existing storage areas for hydrocarbons/chemicals to be compliant with AS 1692; and • Discussions with C Standring acknowledging that this is a new structural requirement imposed on pre-existing infrastructure and that no assessment to confirm compliance with this standard has been completed. This will take some time. EDL requests the removal of the reference to AS1962 in Table 1 row 6. EDL performs regular checks of tank integrity and surrounding bunded areas to confirm no discharges of hydrocarbons / chemicals to the environment	DWER notes that Table 1 Row 6 makes reference to AS 1940 and AS 1962 and that the removal of AS 1692 will not increase the risk of emissions from this infrastructure. DWER acknowledges that the Licence Holder has existing management controls in place to detect any issues with this infrastructure in a timely manner and therefore agrees to remove the reference to AS 1692 in Table 1 row 6. The reference to AS1940 will remain as the existing infrastructure was designed to comply with this standard.
EDL notes: • The new requirement to store existing diesel day tanks, waste oil and lubricant tanks in an enclosed shed with a sump to collect fuel spillage; and • Discussions with C Standring acknowledging that this is a new structural requirement imposed on pre-existing infrastructure EDL advises that the tanks are currently stored in a concrete bunded area and integrity and capacity of bunds are regularly checked.	DWER notes that Table 1 Row 7 makes reference to diesel day tanks being stored in a bund that complies with AS 1940 and also requires that that they are stored in an enclosed shed on impermeable concrete bunded area with a sump to collect fuel spillage. DWER imposed the second part of this condition based on assumptions made from existing infrastructure described in the amendment application supporting documents and premises plan diagrams. DWER acknowledges that the Licence Holder has existing management controls in place to detect any issues with this infrastructure and that the reference to compliance with AS 1940 will remain. DWER therefore agrees to remove the reference to "enclosed shed on impermeable concrete bunded area with a sump to collect fuel spillage" in Table 1 row 7.	EDL notes: • The new requirement to store existing diesel day tanks, waste oil and lubricant tanks in an enclosed shed with a sump to collect fuel spillage; and • Discussions with C Standring acknowledging that this is a new structural requirement imposed on pre-existing infrastructure EDL advises that the tanks are currently stored in a concrete bunded area and integrity and capacity of bunds are regularly checked.
EDL requests DWER refer to comments in the body of their letter of response to the 21 day	As mentioned above in Item 1, DWER has formed the view that the proposal to use 3 x diesel engines for around 32 hours/month from Nov-March during peak electricity demand times in summer	EDL requests DWER refer to comments in the body of their letter of response to the 21 day draft licence and decision report. EDL does not believe these conditions are warranted given that the CAT

Condition of Licence or section of Amendment Report	Summary of Licence Holder comment	DWER response
draft licence and decision report. EDL does not believe these conditions are warranted given that the CAT diesel engines are operated as emergency standby generating units.	represents peak load management and considers this a routine operating scenario for that time of year rather than an emergency scenario. This type of use is therefore not considered to meet the definition of emergency standby generating units. DWER does not agree to removing conditions 4, 6, 13 and 15, and provides specific comments to each of these conditions below. **Condition 4** has been imposed to ensure the diesel engines are only operated for up to 32 hours per month from November to March until 31 December 2020, in accordance with EDL's amendment application. The Delegated Officer has also imposed an operational limit requiring only low-sulphur content diesel to be used in the diesel engines to ensure minimal SO_2 emissions are generated. This condition has been imposed based on the risk assessment outlined in the draft decision report that found there is a medium risk that the use of the diesel generators during these peak demand times, in combination with the operation of the gas engines, could result in an exceedance of the NEPM Ambient Air Quality 1 hourly NO_2 criteria. Based on the limited available information in the amendment application to perform the risk assessment, the Delegated Officer determined it appropriate to impose such limits for a period of 12 months to allow the EDL sufficient time to reconsider options for generating peak shaving electricity requirements or alternatively, demonstrate to DWER (via predictive emissions modelling or ambient air monitoring at nearest receptors) that the use of the diesel engines during these times does not present a significant risk of exceeding the NEPM Ambient Air Quality NO_2 1 hourly criteria. **Condition 6** has been amended to require one round of emissions testing of the peak shaving diesel generators during normal operating conditions to validate the emissions from these generators against design emission specifications and further inform future risk assessments. **Condition 13** has been imposed to require notification to DWER, within 7 days, of any exceedance against licence conditions. This is a standard condition imposed when operational limits have been applied to any licence and is justified given the assessed	diesel engines are operated as emergency standby generating units.

Condition of Licence or section of Amendment Report	Summary of Licence Holder comment	DWER response
	risk of exceeding the NEPM Ambient Air Quality NO_2 1 hourly criteria (and potentially impacting public health) when using the peak shaving diesel generators. **Condition 15** – see DWER response in row 10 below	
Condition 5, Table 5	EDL notes: • That total petroleum hydrocarbon (TPH) requirement in the current licence is <15mg/L, but the amended licence states Total Recoverable Hydrocarbons (TRH) limit is now <5mg/L ; and Discussions with C Standring acknowledging that this is a typographical error and the reference should be <15mg/L TRH.	DWER notes the typographical error in the draft amended licence and therefore agrees to this change.
Condition 6, row 2	EDL notes that the licence provides for SO_2 emissions to be measured using USEPA method 6. This is a wet chemical method and we note that there is a better method, namely to the USEPA method 6C, which involves the use of instrument analysers, which has the benefit of being a safer operational practice, less cumbersome and, with current instrument analysers, produces consistently repeatable results. EDL respectfully requests to change the USEPA method 6 to USEPA method 6C.	DWER agrees to this change.
Condition 6, row 2	EDL notes the requirement for PM_{10} monitoring. This monitoring is time consuming and EDL considers that it is not indicative of gas engine emissions given the results of the last 4 years. Results indicate levels below the limit of laboratory detection (see table below). EDL respectfully requests that this parameter be removed from the monitoring requirements.	DWER has reviewed the monitoring data for PM_{10} emissions from the gas generators for the last 4 years. DWER acknowledges the very low levels as indicated in stack test sampling results indicating that this parameter is not a significant pollutant from the gas engines at Broome Power Station. DWER therefore agrees to review the monitoring of this parameter as part of a final licence amendment as requested by EDL, with a view to removing the requirement for PM_{10} monitoring required by Condition 6, row 5.
Condition 15	EDL notes the content of the Annual Environmental Report has significantly expanded in the draft licence. EDL has recently received a new licence from the DWER in respect of another site	DWER has considered this request from EDL and notes the following:

Condition of Licence or section of Amendment Report	Summary of Licence Holder comment	DWER response
	which does not require this level of detail to be included. EDL notes the scope of the Annual Environmental Report will impose significant administrative burden on personnel, and respectfully request that this condition be reinstated in its original form – that is, an obligation to report on the environmental aspects referenced in rows 6 and 9.	• the Delegated Officer notes the requirement to report on compliance with licence conditions each year via the Annual Audit Compliance Report. The Delegated Officer therefore agrees to remove the requirement to report on the operation of the peak shaving generators in accordance with operational limits specified in condition 4. • Summary of complaints: the objective of this condition is to ensure that any complaints made to the licence holder are recorded and reported to DWER. This is a standard reporting condition imposed on all DWER licences. As such, DWER does not agree to this change. • Issues raised from previous inspections or incident responses: DWER does not agree that this will create significant additional administrative burden to the Licence Holder, as this requirement will only be triggered in the year of an inspection by DWER that occurs on average every 3-5 years (where issues were raised) or where an incident response is triggered. This reporting condition is designed to identify potential impacts, trends and emerging risks and to inform future risk assessment. As such, DWER does not agree to this change. Any changes to site boundaries, location of groundwater monitoring bores, surface drainage channels and on-site or off-site impacts or pollution: DWER notes that this condition only requires reporting against in the event of one of the changes outlined. As above, this reporting condition is designed to identify potential impacts, trends and emerging risks and to inform future risk assessment. As such, DWER does not agree to this change.
Licence Holder Comments received on 16 April 2020		
Condition 4, Table 4	EDL requested changes to Operational Limits specified in Table 4 by providing an exception to when the limits applied, such that operation limits are not applied during times when the CAT3512 engines are operated as emergency or standby power generating plant	DWER agrees to this change and notes that engines used as emergency standby generators in emergency situations are not considered a prescribed premises and therefore not subject to licensing under Part V of the EP Act.

Condition of Licence or section of Amendment Report	Summary of Licence Holder comment	DWER response
	EDL requested a change to the timeframes associated with operational Limits, to allow the CAT3512 engines to be used from October to April for a total of 224 hours instead of between November to March for only 32 hours per month. This change will allow for a level of operational flexibility over the period rather than committing to a monthly limit. This better reflects how the units will operate in practice	DWER agrees to this change.
	EDL requested the following be included in Table 4 'Shall operate as emergency or standby power generating plant throughout the year, including: • operated for brief periods throughout the year to ensure regular servicing; • preceding, during and following cases of disruption to the supply of LNG to the Main Station as reasonably required to manage LNG inventories and maintain the continuous supply of electricity to the Broome community (unlimited hours); and • in the event of unplanned equipment failure that affects the use of a gas generator(s) (unlimited hours)'	DWER agrees to this change and has included this wording in the definitions section of the licence for clarity and to complement defined terms 'Peak Shaving' and 'Prime Generator'.
	EDL requested addition of the following wording to Table 4: "The Operational limits in this Table 4 (excluding those relating to the use of low sulphur diesel) shall be reviewed prior to 30 April 2021 following the provision by the Licence Holder to the CEO of air quality modelling in relation to the CAT3512 diesel fuelled engines"	DWER agrees to this change and has included it as Note 2 to Table 4 in the licence.