Pinjar Gas Turbine Station
Noise Regulation 17 Variation

Western Power Corporation

Report and Recommendations of the Environmental Protection Authority

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Perth, Western Australia

Bulletin 1130

Regulation 17 Report 7

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Summary and Recommendations

Introduction

Western Power Corporation (Western Power) applied in 1998 to the Minister for the Environment under regulation 17 of the *Environmental Protection (Noise) Regulations 1997* ("the noise regulations"), for approval to vary from the prescribed standard, in relation to noise emissions from all of its noise-emitting facilities.

The application was referred by the Minister to the Environmental Protection Authority (EPA) for assessment as required under noise regulation 17 (2). Where the EPA is of the view that noise emissions will vary from a prescribed standard in the noise regulations, the EPA is to inform the Minister, assess the application, and report to the Minister.

The Western Power noise regulation 17 application has been split into several separate applications, as follows –

- Regional Power Stations – assessed in 2002, EPA Bulletin 1074, October 2002;
- Transmission Substations – the subject of a separate Bulletin in preparation; and
- Major Power Stations (Pinjar, Kalgoorlie, Geraldton, Kwinana) – to be assessed individually.

This report considers only the noise emissions from the Pinjar Gas Turbine Station, and provides the EPA's advice and recommendations, as required by noise regulation 17(3)(b).

In essence, Western Power has applied for a noise regulation 17 approval to be granted so as to permit the existing noise emissions to comply with the prescribed standards in the regulations. The basis for the application is that the noise exceedance only extends for a short distance over the Power Station boundary into bushland, and therefore represents no significant noise impact.

EPA Advice

Through this assessment the EPA has formed the view that –

- the current noise emission levels are likely to exceed the levels set in the prescribed standard in the regulations, within an area some 100m to the west and 200m to the north from the Pinjar Gas Turbine Station boundary; and
- while noise reduction measures could possibly be implemented to achieve compliance at a cost of some $1.5m, the land over which the exceedance occurs is undeveloped bushland that is unlikely to be developed, and as a result there is no impact.

Recommendations

The EPA recommends that a variation to the prescribed standard in the noise regulations be granted in accordance with the attached preliminary drafting instructions. (See Appendix B).

Contents

1. Introduction and Background

Western Power is a corporatised utility owned by the State Government of Western Australia that generates, distributes and supplies electricity to industrial, commercial and residential customers throughout Western Australia.

The Generation Business Unit (GBU) of Western Power is responsible for the management, operation and maintenance of major power stations at Muja, Kwinana, Collie and Pinjar.

Pinjar Gas Turbine Station is located approximately 40 kilometres north of Perth. The site consists of six Frame 6 and three Frame 9 gas turbine units and has a total generating capacity of 585 Megawatts (MW). The Pinjar Gas Turbine Station was constructed in various stages from 1989 to 1996. Plant installed at Pinjar is currently used to provide peaking power for Western Power's South West Interconnected grid, which supports the major load requirements for southern Western Australia.

Western Power conducted an assessment of noise emissions from its facilities prior to the noise regulations coming into effect on 31 January 1998. A total of 151 Western Power facilities, including substations, gas turbines, regional power stations and major power stations were considered. On 29 January 1998, noise regulation 17 variations were requested for all Western Power sites being assessed. Pinjar Gas Turbine Station was one of the Western Power sites that was assessed in the Screening Assessment and for which a variation of the noise standards was requested. The report "Screening Assessment of Noise Emissions from Western Power Facilities, October 1998" was provided to the Department of Environmental Protection in October 1998 in support of the request for noise regulation 17 variations for Western Power facilities.

A further report by Western Power titled "Pinjar Gas Turbine Station – Submission to the Environmental Protection Authority", dated August 2002, provided detail on the application in relation to the Pinjar site. The EPA assessment strategy for this site was set in March 2003.

2. The Application

Noise regulation 17 provides that *"where a person is of the opinion that he or she cannot reasonably or practicably comply with a standard prescribed under these regulations ... that person may apply to the Minister for approval to allow the emission of noise in that case to exceed or vary from the standard."*

Western Power has applied to the Minister for the Environment for an Approval pursuant to noise regulation 17 to enable it to vary its noise levels from the prescribed standard in the noise regulations. In accordance with noise regulation 17, the Minister has referred the application for variation to the EPA for assessment.

The basis of Western Power's application in relation to the Pinjar Gas Turbine Station is that the assigned noise levels are only exceeded over an area approximately 100 metres outside the site boundary to the west and 200 metres to the north. This land is undeveloped bushland that is highly unlikely to be developed as it sits on top of the

Gnangara Water Mound and may be incorporated in parkland covered by the proposed "Gnangara Park". There is no situation where the assigned noise levels for a developed noise-sensitive premises such as a residence are exceeded.

The estimated cost to ensure that the assigned levels are met at the site boundary is in the order of $1.5 million. Western Power believes it is unreasonable and not practicable for this money to be spent to lower noise emissions when the only impact is on surrounding bushland.

Western Power has committed that any future development at the site will comply with the noise regulations, including any noise regulation 17 approvals that may be in place for the site.

Western Power has requested that a noise regulation 17 variation be approved allowing for the exceedance of the prescribed standard by up to 6 dB(A) for up to 250 metres outside the boundary of the Pinjar Gas Turbine Station to the north and west of the site.

3. Noise Assessment

3.1 Location

Pinjar Gas Turbine Station is located approximately 40 kilometres north of Perth at Lot 11191, Perry Road, Nowergup in the City of Wanneroo. It is situated within bushland to the east of the Pinjar Pine Plantation. The land that surrounds Pinjar Gas Turbine Station (Lot 12887) is zoned State Forest and is undeveloped bushland that is unlikely to be developed as it sits on top of the Gnangara Water Mound and may be incorporated in parkland covered by the proposed "Gnangara Park".

The nearest residential noise-sensitive premises is situated 4.1 kilometres south of the Pinjar Gas Turbine Station.

3.2 Description of Pinjar Gas Turbine Station

The Pinjar Gas Turbine Station was constructed in various stages from 1989 to 1996. Site work commenced in 1986 with the gas turbine plant being installed in 4 stages:

Stage A: Two General Electric (GE) Frame 6 units (Units 1 and 2) supplied by Hitachi of 37.4 MW capacity commissioned in 1990 (North end of site).

Stage B: Five GE Frame 6 units (Units 3 to 7) supplied by European Gas Turbines (EGT) each of 38.3 MW capacity, commissioned in 1991. Unit No. 6 was subsequently decommissioned in May 1998 for relocation to Kwinana.

Stage C: Two GE Frame 9 units (Units 9 and 10) supplied by John Brown Engineering, each of 116.4 MW capacity commissioned in 1991 and 1993.

Stage D: One GE frame 9 unit (Unit No 11) of 123.7 MW capacity supplied by EGT commissioned in 1996 (South end of site).

The final configuration of the site consists of six Frame 6 and three Frame 9 gas turbine units with a total generating capacity of 585 MW. The gas turbines were constructed with noise attenuation measures installed on the unit enclosure, air intake and exhaust stack.

3.3 Assigned Noise Levels

The prescribed standard for noise emissions under the noise regulations is set in terms of assigned noise levels for noise received at premises near Pinjar Gas Turbine Station. The surrounding land (Lot 12887) is zoned State Forest and is considered to be a noise-sensitive premises under Schedule 1 Part C.4 of the noise regulations for the purposes of this assessment. (Note: Schedule 1: Description of premises receiving noise – Part C: noise-sensitive premises – Clause C.4: Other premises not included in this Part).

As there are no dwellings in this State Forest, the assigned noise level at the boundary of the Pinjar Gas Turbine Station is taken from Table 1 of the noise regulations to be that for the part of a noise-sensitive premises that is more than 15m from a building directly associated with a noise-sensitive use, as follows (See Appendix A):

All Hours	L_{A10} 60 dB(A)	L_{A1} 75 dB(A)	L_{Amax} 80 dB(A)

The noise emission from the Pinjar Gas Turbine Station is constant in characteristic. Therefore the L_{A10} is the most relevant criterion for noise emissions from the plant. The assigned L_{A10} noise level at the nearest residence, 4.1km from the Pinjar Gas Turbine Station, is 35dB(A) for the night period from 10pm on any night to 7am on Monday to Saturday or 9am on Sunday and public holidays.

Assessment of noise emissions from the Pinjar Gas Turbine Station has indicted that the noise is not tonal.

3.4 Noise Studies

The Screening Assessment conducted by Western Power in 1998 indicated that Pinjar Gas Turbine Station did not comply with the prescribed standard in the noise regulations. The worst case exceedance of assigned noise levels was found to be 15 dB(A) against an allowed L_{A10} level of 60 dB(A) at the boundary. The noise emission data used for modelling noise emissions from the station was that obtained from acceptance tests during commissioning and some noise survey work. The cost for total compliance with the noise regulations was then estimated at $10.5 million. To achieve this reduction, modifications to the exhaust stack and radiator fans of the six Frame 6 units and exhaust system rebuilds and fan changes to the three Frame 9 units were required. Costs of incremental noise reductions were estimated at $1.3 million for a 5 dB reduction and $1.7 million for a 10 dB reduction.

Subsequent to the Screening Assessment, Western Power engaged Vipac Engineering and Scientists to conduct an extensive program to measure and model current noise emissions from the Pinjar Gas Turbine Station and assess noise treatment options.

In relation to compliance with assigned noise levels, the main conclusions of the Vipac report were as follows:

- worst case noise exceedance of 6 dB(A) against the L_{A10} 60 dB(A) assigned level at the boundary of the site. The 60 dB(A) contour extends approximately 100 metres outside the boundary to the west and 200 metres to the north; and
- modelled noise levels at the nearest residence are below the L_{A10} assigned level for night time of 35 dB(A).

The EPA notes the above studies and accepts the results in the Vipac study as representative of the noise emissions from the Pinjar Gas Turbine Station. The EPA therefore finds that the noise emissions comply with the prescribed standard at the nearest residence, but do not comply with the prescribed standard at the site boundary.

3.5 Noise reduction

The EPA would normally only recommend approval of a regulation 17 application in cases where the applicant demonstrated that they could not reasonably or practicably comply with the prescribed standard.

Engineering noise reduction measures were identified and assessed as part of the Vipac report. In summary, a gas turbine works by compressing air, which is mixed with natural gas and fired in a combustion chamber producing hot exhaust gases. The hot gas is then expanded in a turbine that drives a compressor and an electricity generator producing electricity. The hot gases leaving the gas turbine are exhausted through a stack.

A typical gas turbine consists of the following components:

- Air Compressor
- Gas combustion system
- Power turbine
- Electrical generator
- Exhaust stack

The main noise sources include the turbine, electricity generator and exhaust stack.

The noise control measures assessed for Pinjar Gas Turbine Station are detailed in the Vipac report along with costing and an estimate of the reduction in boundary noise levels afforded by the measures. In summary, the work proposed includes the construction of noise barriers and silencer refurbishment for units 1, 2, 9 and 10.

The estimated cost of measures to ensure that the assigned levels are met at the site boundary is in the order of $1.5 million. The EPA accepts this analysis, and considers that the benefits of carrying out this work are so minor as to render the work impracticable, given the small area of undeveloped bushland that is affected.

The EPA notes that the Vipac report also recommended that Western Power investigate the option of exchanging land from the southern end of the site for land at the north and west of the site in order to comply with the noise regulations. The EPA notes that this option was investigated and not found to be feasible.

The EPA is therefore of the view that compliance with the prescribed standards in the noise regulations is not practicable in the case of the Pinjar Gas Turbine Station.

3.6 Future Compliance

As part of the assessment, the EPA put a series of questions to Western Power regarding the likelihood of achieving compliance with the prescribed standard in the future. The questions and responses are given below.

Question 1 *Will noise levels decrease over time?*

Answer It is unlikely that noise levels will decrease with time. There are no plans for the installation of further noise reduction measures. The reason for this

is that the area where the noise regulations are exceeded is relatively small. The area affected is bushland, which has limited recreational use. The nearest noise sensitive premise is situated 4.1 km south of the station, with modelling indicating no situation where the noise regulations are exceeded.

Question 2 *Will new units be specified to be quieter?*

Answer New units will be specified to comply with the requirements of the Western Australian Noise Regulations.

Question 3 *Will compliance be achieved at some future date?*

Answer It is unlikely that noise levels will decrease, therefore it is unlikely that compliance will be achieved at some future date. Western Power does not believe this is a big issue as the impact of the noise emissions is minimal.

4. Community Impacts and Consultation

The EPA notes that community use of the land surrounding Pinjar Gas Turbine Station is limited to recreational 4-wheel drive use, shooting and honey production. The area where the noise regulations are exceeded is relatively small and lies close to the station. It is believed that the period of time where any of these uses would occur within the affected area would be extremely small and not present a major impact on the users.

The nearest noise sensitive premises is situated 4.1 kilometres south of the Pinjar Gas Turbine Station. There is no situation where modelling indicates that assigned levels for a developed noise sensitive premises such as the closest residence will be exceeded.

Western Power has advised that it is not aware of any complaints from the community regarding noise emissions from Pinjar Gas Turbine Station.

While there has been no community consultation regarding this noise regulation 17 application, it is the EPA's view that the local community is not significantly affected by noise emissions from Pinjar Gas Turbine Station.

5. Outline of Noise Regulation 17 Approval

The EPA considers that, should an approval be granted, it should contain a 6 dB(A) variation to the $L_{A\ 10}$ assigned level of 60dB(A) at all times for that part of a noise-sensitive premises that is more than 15m from a noise-sensitive building, and is within 250m of the western or northern boundaries of the site. This would allow the existing noise levels to be emitted in accordance with the regulations (See Appendix B).

6. Conclusion and Recommendation

The EPA concludes that –

- the current noise emission levels are likely to exceed the levels set in the prescribed standard in the regulations, within an area some 100m to the west and 200m to the north from the Pinjar Gas Turbine Station boundary; and
- while noise reduction measures could possibly be implemented to achieve compliance at a cost of some $1.5m, the land over which the exceedance occurs is undeveloped bushland that is unlikely to be developed, and as a result there is no impact.

The EPA recommends that a variation to the prescribed standard in the noise regulations be granted in accordance with the attached preliminary drafting instructions. (See Appendix B).

Referenced material:

1. "Pinjar Gas Turbine Station – Environmental Noise Propagation and Treatment", Vipac Engineers and Scientists Ltd, April 1999

Appendix A

Details of Noise Limits

Appendix A – Assigned levels in regulations

Table 1 - Assigned Levels derived from Table 1 of Regulation 8 of the *Environmental Protection (Noise) Regulations 1997*

Type of premises receiving noise	Time of day	Assigned level, dB		
		$L_{A\ 10\ (slow)}$	$L_{A\ 1\ (slow)}$	$L_{A\ max\ (slow)}$
Noise sensitive premises, at locations within 15 metres of a building directly associated with a noise sensitive use.	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays.	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises, at locations further than 15 metres from a building directly associated with a noise sensitive use.	All hours	60	75	80
Commercial Premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90

"$L_{A\ max}$ assigned level" means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded at any time;

"$L_{A\ 1}$ assigned level" means an assigned which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 1% of the representative assessment period;

"$L_{A\ 10}$ assigned level" means an assigned which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 10% of the representative assessment period; and

"influencing factor" means the influencing factor determined under Schedule 3 of the regulations.

Note: The influencing factor for the nearest residence 4.1km from the Pinjar GT Station is likely to be zero.

Appendix B

Preliminary Drafting Instructions for a Noise Regulation 17 Approval

PRELIMINARY DRAFTING INSTRUCTIONS
FOR A NOISE REGULATION 17 APPROVAL

AUTHORITY:

The Approval would be granted by the Minister for the Environment under regulation 17 (7) of the *Environmental Protection (Noise) Regulations 1997* after receiving a report from the Authority for the purposes of the regulation.

CITATION:

(1) The Approval may be cited as the *Environmental Protection (Pinjar Gas Turbine Station Noise Emissions) Approval 2004.*

COMMENCEMENT:

(2) The Approval would come into operation on the day of publication in the *Gazette.*

INTERPRETATION:

(3) The following terms may need definition:

"abnormal event" means an unexpected event the occurrence of which is beyond the immediate control of, and could not reasonably have been foreseen by, Western Power (such as an accident or emergency, a breakdown of plant or equipment);

"assigned level" means a noise level determined under clause 6;

"construction work" has the same meaning as in regulation 13;

"commencement" means the day on which the Approval comes into operation;

"commercial premises" has the same meaning as in regulation 2(1);

"Director" means the Director of the Environmental Management Division, Department of Environmental Protection;

"impulsiveness" has the same meaning as in regulation 9;

"industrial and utility premises" has the same meaning as in regulation 2(1)

"$L_{A\ max}$ assigned level" means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded at any time;

"$L_{A\ 1}$ assigned level" means an assigned which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 1% of any period of 4 hours;

"$L_{A\ 10}$ assigned level" means an assigned which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 10% of any period of 4 hours;

"$L_{A\ Slow}$" has the same meaning as in regulation 2(1);

"Pinjar Gas Turbine Station" means the premises known as Lot 11191, Perry Road, Nowergup in the City of Wanneroo;

"modulation" has the same meaning as in regulation 9;

"noise-sensitive premises" has the same meaning as in regulation 2(1);

"Western Power" means the body corporate known as Western Power Corporation, ABN 38 362 983 875;

"regulation" means regulation of the *Environmental Protection (Noise) Regulations 1997*;

"tonality" has the same meaning as in regulation 9.

GRANT OF APPROVAL:

(4) Under regulation 17 (7), approval would be granted to Western Power to allow the noise emitted from the Pinjar Gas Turbine Station to exceed or vary from the standard prescribed in regulation 7(1).

CONDITIONS OF APPROVAL:

(5) For the purposes of the Grant of Approval, regulations 7(1) and (2), 8(2) and 9(3) would not apply in relation to the noise emitted from the Pinjar Gas Turbine Station while the Approval is in force and is being complied with.

However, the Approval would be granted on the condition that –

a) noise emitted from the Pinjar Gas Turbine Station complies with the maximum permitted noise levels (below); and

b) Western Power complies with the requirements relating to abnormal events (below).

MAXIMUM PERMITTED NOISE LEVELS

(6) Noise emitted from the Pinjar Gas Turbine Station, when received at a premises of a kind referred to in column 1 of an item in the Table in Schedule 1, at a time of day referred to in column 2 of the item, should be required not to exceed any of the assigned levels specified opposite the time of day in column 3 of the item (see Schedule 1).

PERMITTED TONALITY, IMPULSIVENESS AND MODULATION

(7) Noise emitted from the Pinjar Gas Turbine Station, when received at premises referred to in column 1 of an item in the Table in Schedule 1, should be required to be free, for at least 90% of any period of 4 hours, from any tonality, impulsiveness and modulation.

DETERMINING LEVELS OF NOISE EMISSION

(8) For the purpose of assessing the level or character of noise emitted from the Pinjar Gas Turbine Station, the following would not be taken into account –

a) noise emitted as a result of construction work carried on at the Pinjar Gas Turbine Station;

b) noise emitted by safety warning devices attached to plant or equipment for the purpose of ensuring that Western Power complies with its obligations under the *Occupational Safety and Health Act 1984*.

NOISE FROM ABNORMAL EVENTS

An emission of noise that contravened the requirements for maximum permitted noise levels or for tonality, impulsiveness and modulation, would be taken not to breach a condition of the Approval if –

a) the emission was the result of an abnormal event;

b) where the emission exceeded the maximum permitted noise levels, it was accidental or unintended;

c) Western Power took all reasonable and practicable measures to stop the emission as soon as was reasonably practicable; and

d) Western Power notified the Director of the occurrence of the abnormal event within 21 days after the day on which it occurred, or within any further time allowed by the Director on the application of Western Power.

ABNORMAL EVENTS REGISTER

Western Power should be required to keep an abnormal events register for the purposes of this Approval.

SCHEDULE 1 – MAXIMUM PERMITTED NOISE LEVELS

Table

Type of premises receiving noise	Time of day	Assigned level, dB		
		$L_{A\ 10\ (slow)}$	$L_{A\ 1\ (slow)}$	$L_{A\ max\ (slow)}$
Noise sensitive premises, at locations within 15 metres of a building directly associated with a noise sensitive use.	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays.	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises, at locations further than 15 metres from a building directly associated with a noise sensitive use, and within 250m of the western or northern boundary of the Pinjar Gas Turbine Station.	All hours	66	75	80
Noise sensitive premises, at locations further than 15 metres from a building directly associated with a noise sensitive use, and further than 250m from the western or northern boundary of the Pinjar Gas Turbine Station.	All hours	60	75	80
Commercial Premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90