

Noise Management Plan

Environmental Noise Management Plan for South Australian Gas Turbines (Lonsdale)

SEPTEMBER 2020

Revision History

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1. INTRODUCTION

The South Australian Gas Turbine project comprises of the operation of four (4) GE TM 2500 generators and associated balance of plant (collectively, the **Plant**) by Infigen Energy SAGT Pty Ltd (**Infigen**). Infigen will lease the Plant from the Treasurer of the State Government of South Australia (**Treasurer**) and the operation of the Plant will provide up to 123MW of generation to the National Electricity Network.

2. BACKGROUND

The Plant is currently located at Chrysler Road, Lonsdale, South Australia adjacent to the SA Water Desalination plant and has been available for emergency dispatch since November 2017. The Plant was established at the Lonsdale location by the State Government as a temporary solution to enable emergency energy distribution and security during the 2017/18, 2018/19 and 2019/20 summer periods and currently operates on an emergency diesel fuel source.

Infigen intends to lease the Plant for 25 years and initially operate it from the existing Lonsdale site until an alternate site at Bolivar has been developed to allow the operation of the Plant on fuel gas. Infigen is currently prevented by the State Government from moving the Plant between the months of November and May as those months are peak demand periods.

2.1 APPROVALS PROCESS

Infigen has registered with AEMO to operate the Plant as a market generator and has agreed to operate it in accordance with a certain operating profile under its agreement with the Treasurer. Infigen intends to use the Plant as part of a portfolio to firm up the intermittent and energy-limited output of electricity generation and storage projects owned by, or contracted to, members of the Infigen group in South Australia and elsewhere from time to time for supply to customers in South Australia.

Infigen also intends to make the generation assets available and bid them competitively into the National Electricity Market at times of high wholesale electricity prices but in a commercially rational manner taking into account certain factors.

Infigen has obtained a Development Approval for the operation of the Plant at the Lonsdale site. As part of the process to obtain a Development Approval, environmental matters and potential impacts to surrounding areas were reviewed and assessed.

In coordination with the EPA, Infigen has carried out noise monitoring of the Plant to predict its noise emissions and any impacts on relevant noise sensitive receptors. Infigen has also conducted background noise level assessment and far field noise measurements during full Plant operations.

It is intended that the requirement for, and implementation of, this Noise Management Plan (**NMP**) in accordance with condition 2.9 Site Noise Minimisation (U-1206) of the Environmental Licence 51178.

The purpose of this NMP is to provide management measures to ensure that potential noise impacts of the Plant at noise sensitive receptors (**NSRs**) at Lonsdale are addressed and minimised where possible. The NMP aims to outline the following:

- Existing environment
- Description of the operational activities, noise data and potential noise impacts;
- Noise measurements
- Noise management measures and additional testing required;
- Description of roles and responsibilities for implementation.
- Community engagement and complaints handling policies

3. EXISTING ENVIRONMENT

3.1 SENSITIVE RECEPTORS

The project site is located in the Infrastructure Policy Area of the Urban Employment Zone of the Onkaparinga Council Development Plan. The nearest residences are located approximately 900m to the north, with additional residential receivers to the east and south at greater distances from the site.

A list of each location in Figure 3-1 is as follows:

- P: The Plant
- R1: Residential receptors north
- R2: Residential receptors east
- R3: Residential receptors south

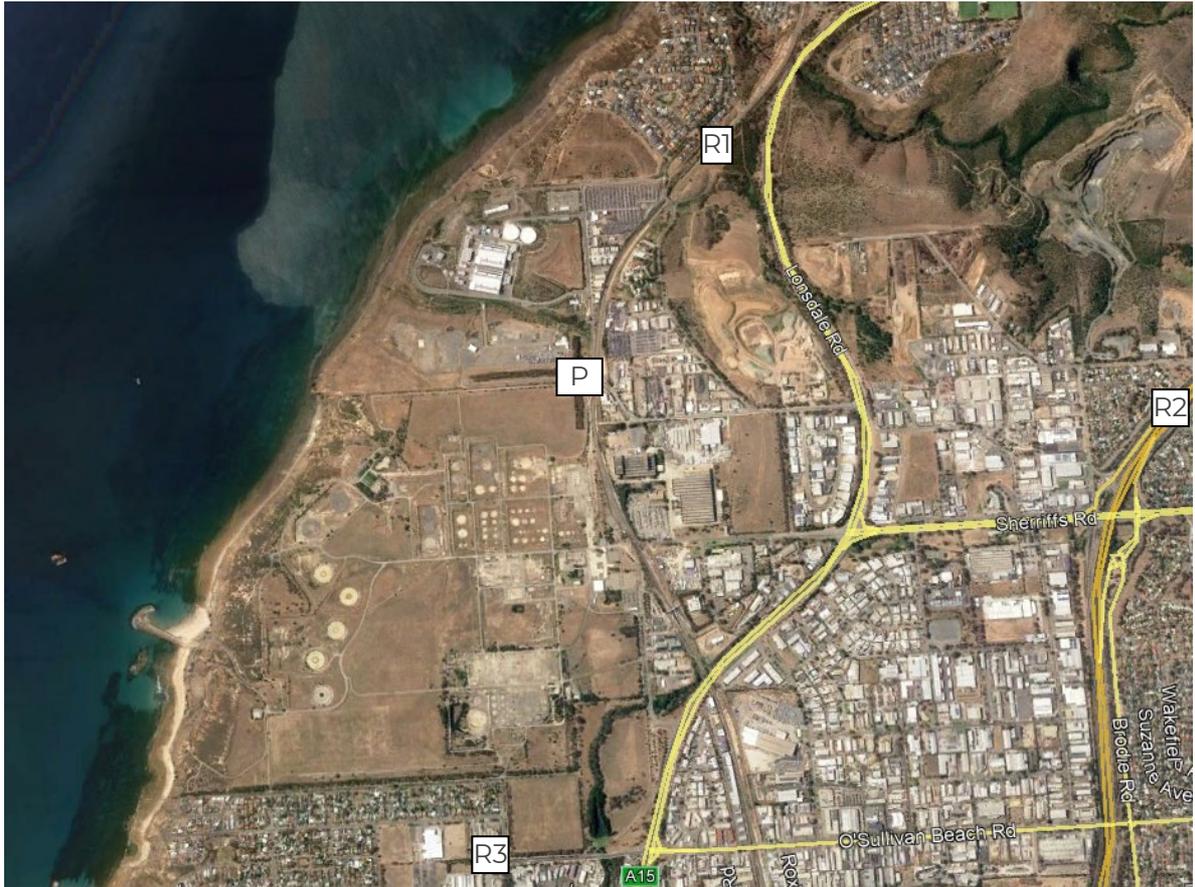


Figure 3-1 Lonsdale Project Site and Surrounding Area

3.2 MEASURED AMBIENT NOISE LEVELS

The current acoustic environment is influenced by significant industrial, road and rail noise sources. Attended noise monitoring was conducted on Friday 6th February 2020 between 12pm and 2.15pm and Sunday 9th February 2020 between 10.15pm and 11.30pm. The results are tabulated in Table 3-2. The average daytime background noise levels (L_{A90}) ranged between 36 and 49 dB(A) and the average night time background noise levels (L_{A90}) ranged between 34 and 42 dB(A).

Table 3-1 Measured Ambient Noise Levels

| Location | Day (7/02/2020) | | | | Night (6/02/2020) | | | |
|----------|-----------------|------------|-----------|-----------|-------------------|------------|-----------|-----------|
| | L_{Aeq} | L_{Amax} | L_{A90} | L_{A10} | L_{Aeq} | L_{Amax} | L_{A90} | L_{A10} |
| R1 | 49 | 71 | 36 | 51 | 40 | 60 | 34 | 43 |
| R2 | 53 | 75 | 43 | 55 | 45 | 67 | 40 | 47 |
| R3 | 51 | 74 | 41 | 52 | 41 | 62 | 36 | 43 |

4. OPERATIONAL ACTIVITIES

Infigen intends to operate the Plant to respond to market conditions. Based on modelling forecasts of previous market conditions in South Australia, Infigen anticipates that it is likely to operate the Plant as follows:

- approximate average operating hours of 113 hours per annum;
- on an annual basis, the Plant is expected to be run for about 91 hours during the 'day' (7am to 10pm) and about 22 hours during the 'night' (10pm to 7am);
- for the 'day' operations (approximately 91 hours):
 - approximately 61 hours is expected to occur between 9am - 5pm; and
 - approximately 30 hours is expected to occur between 7am - 9am and 5pm - 10pm, with the majority of those hours occurring in Q1 and Q3;
- approximately 10% of the overall expected operating hours is expected to occur on weekends, with the majority of starts expected between 2pm and 7pm;
- the average amount of time that the Plant will operate once started is expected to be about 3 hours on weekdays and 2 hours on weekends.

In any event, Infigen will operate the Plant in accordance with condition 3 of the Development Approval (no. 145/V041/20), which provides:

The operation of the turbines must not occur more than 30% of the time in any one weather season (during the day or night period which is defined in the Environment Protection Noise Policy (2007) and that the overall operating hours must not exceed 10% of the total hours in a 12 month period, once operational (excluding when the turbines are required to operate at the directive of the Australian Energy Market Operator and or the South Australian State Government for energy security purposes).

4.1 NOISE PREDICTIONS

Noise predictions have been conducted by Vipac in their report (70B-19-0135-TRP-10150213-3, dated 3rd April 2020), based on a traditional noise model (CONCAWE). Although traditional noise models are the only currently available option for predictions, it is known that these models are not particularly accurate for the noise from exhausts of open cycle gas turbines.

Notwithstanding, predicted noise levels for potential day time and night time operations are summarised in the tables below.

Table 4-1 Noise Modelling Results for Day Time Operations

| Location | Class D 3m/s wind $L_{Aeq,15min}$ | Class D No wind $L_{Aeq,15min}$ |
|----------|--------------------------------------|------------------------------------|
| R1 | 55 | 51 |
| R2 | 47 | 42 |
| R3 | 50 | 45 |

Table 4-2 Noise Modelling Results for Night Time Operations

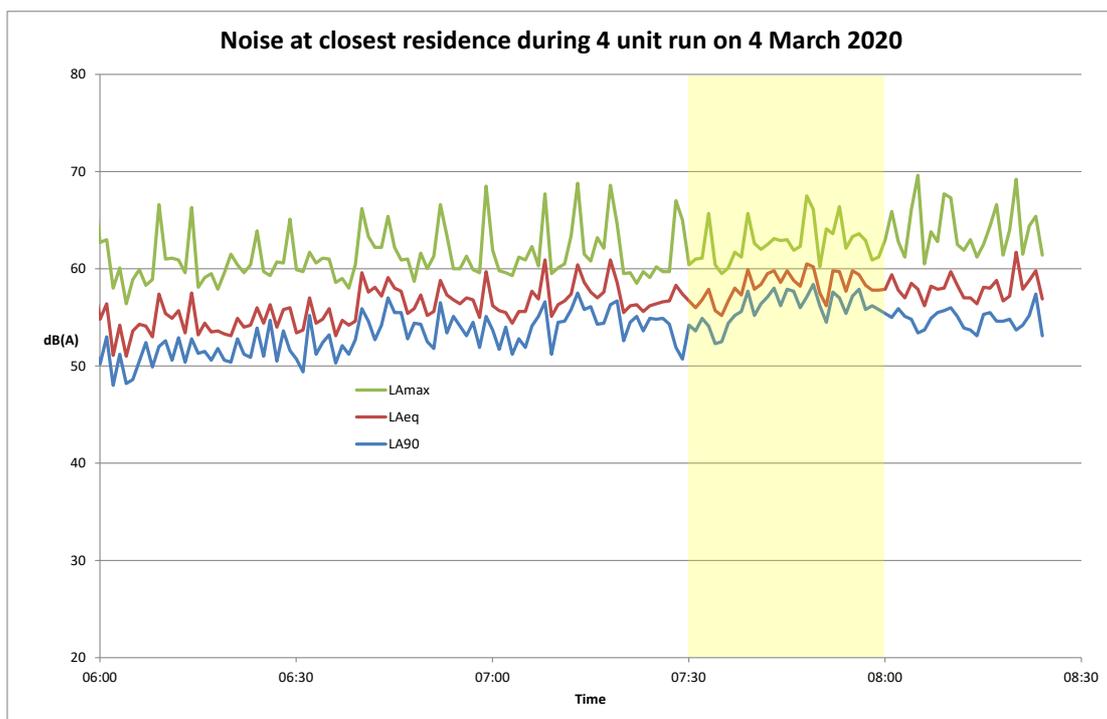
| Location | Class F 3m/s wind | Class F No wind |
|----------|-------------------|-----------------|
| | $L_{Aeq,15min}$ | $L_{Aeq,15min}$ |
| R1 | 56 | 55 |
| R2 | 47 | 47 |
| R3 | 50 | 50 |

This noise model, together with the forecast operation indicates that the noise might exceed goal levels of the *Environment Protection (Noise) Policy 2007* for 1.3% of the day period and 1.2% of the night period, which is well below the percentage considered significant in the *Guidelines for use of the Environment Protection (Noise) Policy*. Further, it is not yet clear if the times of operation will coincide with periods of high ambient noise, which could mask the noise from the Plant and reduce or negate the impact.

4.2 NOISE MEASUREMENTS

Noise measurements were conducted during a planned operation on 4 March 2020 between 7:30am and 8:00am. During the testing, the noise was measured at a number of locations, including adjacent to the closest residences on Freebairn Drive. During the measurements, there was a breeze from the South East, which represents the most common wind direction in the area. A noise logger adjacent to these residences measured the noise in one-minute intervals prior to, during and after the operation of four units at full load. The measured noise levels are shown in the graph below:

Figure 4-1: Noise Measurements



The graph shows no stepped increase in noise as the units are operated and no stepped decrease as the units shut down. Short term manual measurements, during lulls in traffic, indicated that the contribution of noise from the power station was approximately 51 dB(A). Relevantly, the graph shows that prior to and after the operation, the background noise level was no less than 49 dB(A). As the contribution of noise from the power station was not more than 5 dB(A) above the background noise level, no penalty for noise character is applicable and the power station was compliant with the *Environment Protection (Noise) Policy 2007* at this time.

This measurement demonstrates that the plant has the potential to operate within the existing noise environment in compliance with the *Environment Protection (Noise) Policy 2007*.

4.3 POTENTIAL NOISE IMPACTS

The potential impact of noise from the Plant is dependent on a number of factors. These include:

- The time of operation;
- The frequency of operation;
- The ambient noise environment while operating;
- The meteorological conditions present;
- The number of turbines operating; and
- The power output of each of the turbines.

While Section 4.1 provides predictions in accordance with the modelling methodology of the *Environment Protection (Noise) Policy 2007*, it is known that the noise from gas turbine exhaust stacks is not well modelled by standard noise models. This phenomenon was described by Leav et al¹ in a paper presented at the 2018 Australian Acoustical Society Conference.

Given this phenomenon, and the potential for ambient noise to mask the noise from the plant (as demonstrated in Section 4.2 above), it is critical that additional noise measurements be conducted to better understand the noise levels and associated impact (if any) experienced at residences, and the frequency of occurrence. Therefore, a noise measurement regime is proposed below, to form the first action of the noise management plan.

5. NOISE MANAGEMENT MEASURES

Noise management measures for operational activities and noise monitoring processes are described in this section of the NMP.

¹ Leav O.Y.J.,B.S. Cazzolato, C.Q. Howard. 2018 “*Experimental analysis of sound directivity from sound propagation through non-isothermal, turbulent exhaust jets in cross-flow*”. Acoustics 2018 Adelaide, Australia, 6-9 November.

5.1 NOISE IMPACT MITIGATION MEASURES

Noise impact mitigation measures have been outlined previously and included the contemplation of additional external noise barriers in close proximity to the generating units and exhaust silencer extensions. They have not been pursued due to not being reasonable and practicable when there is a lack of specific noise data and sufficient understanding of noise impacts to surrounding sensitive receivers. That is, design of attenuation measures based on the current state of knowledge could result in:

- noise criteria which are exceeded even after the implementation of the attenuation; or
- unnecessary attenuation being installed if the Plant does not currently exceed ambient noise levels at times when it operates.

5.2 NOISE MEASUREMENT

To assist in understanding and mitigating the impacts of the Plant's noise emissions, Infigen is committed to carrying out additional noise measurements and monitoring, once the lease of the Plant has commenced. As Infigen intends to operate the Plant more frequently than it was operated by the State, Infigen will undertake a more extensive monitoring campaign to enable the impact of the noise at residences to be accurately assessed during the Plant's operations.

The extensive noise monitoring campaign will allow Infigen to properly understand the actual noise impacts of the Plant and be able to propose tailored and effective noise mitigation measures for the current site (if required) and more importantly for the permanent site at which it intends to relocate the Plant.

Infigen will conduct noise logging for a period sufficient in time to cover all operating scenarios. Each time the Plant is operated, an analysis of the change in noise level during the operation will be made and an assessment against the goal noise levels of the *Environment Protection (Noise) Policy 2007* will be made. To ensure that the noise monitoring campaign is effectively being carried out, Infigen will consult with the EPA, including updating the EPA on the proposed or actual noise logging activities that Infigen intends to undertake or that it has undertaken.

During the period of the noise monitoring campaign, further investigations will be made into any reasonable and practicable measures which could be taken to reduce the noise. This assessment will include the investigation of the latest technology in reducing noise from gas turbine exhausts. In particular, the investigation will include interaction with the University of Adelaide, which has developed and patented a device to reduce stack exhaust noise.

Infigen will assess the need to continue the noise monitoring campaign after the end of each season, taking into account the results of each Quarterly Report (as defined in Section 7 below). However, Infigen will not cease the noise monitoring campaign until such time as the EPA agrees in writing that noise monitoring is no longer necessary.

Following the completion of the noise monitoring campaign and the investigation of possible measures to reduce the noise, the requirement for, and the extent of, future acoustic treatment measures will be determined in consultation with the EPA.

5.3 NOISE MONITORING PROCESS

Noise monitoring will be conducted in accordance with the *Environment Protection (Noise) Policy 2007* at a location representative of the closest residences. Permission will need to be sought to place the logger but it is anticipated that the logger could be placed in the area highlighted in the figure below:



The Sound Level Meter (**SLM**) placement will meet the following requirements:

- The SLM used in noise measurement will have a current NATA laboratory calibration;
- The logger will be placed by an acoustical engineer;
- A windscreen will be attached and the SLM settings will include a windscreen factor;
- The SLM will be set to record A-weighted sound pressure levels with fast response; and
- The SLM will be field calibrated using an appropriate calibrator before and after measurements. Pre and post measurements should not differ by more than 0.5 dB(A).

For each operation of the Plant, Infigen will log the power output from each of the turbines so that the recorded noise levels can be correlated with the operation. An analysis, similar to the analysis conducted for the operation on 4 March, will be conducted to determine compliance with the *Environment Protection (Noise) Policy 2007*. An analysis will also be conducted of the noise character to determine if any tonal, low frequency or modulating character is present.

6. COMMUNICATION

6.1 PREVIOUS COMMUNICATIONS

When the South Australian Government announced that it would install and operate the Plant and other generators at Elizabeth in 2017, letters were sent to residents and businesses in the vicinity of the project sites to outline the nature and purpose of the project, with some preliminary information about the operational conditions and predicted air quality and noise emissions associated with the turbines.

During the two-week community consultation period, another letter with similar information was sent to potentially impacted residents. In addition, representatives from the State Government door-knocked residents to the north of the project site to talk with people about any concerns or questions they had about the project. Overall the response was positive, with residents expressing satisfaction with the level of information and engagement thus far.

One expression of concern was received during the community consultation period, which was addressed by the State Government.

During the commissioning phase, and prior to the Plant transitioning to full operational phase, another letter was sent to residents thanking them for their patience during construction and reminding them of the contact information and suggesting they utilise the *Alert SA App* to be kept informed of any imminent load shedding events.

The State has also written to local residents and businesses to inform them of the transition of the Plant to Infigen.

6.2 INFIGEN'S COMMUNITY ENGAGEMENT PROCESS

Infigen has communicated directly with local residents and business to inform them of the transition and operational landscape prior to the date of transition.

Infigen will continue to engage with the community in accordance with its Community Engagement Policy and the site-specific Community Engagement Plan, in accordance with Environmental Licence condition 2.2 (U-1209). A copy of the Community Engagement Policy and Community Engagement Plan may be found on Infigen's website or provided on request.

6.3 COMPLAINTS HANDLING PROCESS

Infigen will respond to and manage complaints in accordance with its Complaints Handling Policy. A copy of this policy may be found on Infigen's website or provided on request.

Infigen has also developed a site-specific Complaints Protocol, which it will implement for the project.

Complaints handling will also be undertaken in accordance with Environmental Licence condition 2.3 (S-1) . Where noise complaints are made regarding noise from construction or operational activities, each complaint will be investigated. In particular, Infigen will:

- (i) have a Noise Complaints Register and record details of noise complaints;
- (ii) investigate complaints against applicable noise limits; and
- (iii) prepare a response to the complainant detailing outcomes of the investigation.

7. Reporting

During the Plant's operational phase, Infigen will provide a written report to the EPA within 30 days of the end of each season (ie four times per year) (**Quarterly Report**). The Quarterly Report will include the following information:

- total number of hours of commercial operation for the season (expressed as both a total number and the percentage of the total hours in the season);
- total hours of commercial operation for the calendar year as at the end of the relevant season;
- results of noise monitoring during the relevant season;
- number of any noise complaints received and the actions taken to address these during the relevant season; and
- a summary of the implementation and effectiveness of the Noise Management Plan.

Infigen will also provide to the EPA an annual report within 45 days of the end of each operational year² that summarises the information provided in the Quarterly Reports and the implementation and effectiveness of the Noise Management Plan for that year (**Annual Report**).

Infigen will upload this Noise Management Plan to its website. Additionally, within 7 days of submitting a Quarterly Report and Annual Report to the EPA, Infigen will upload copies of those reports to its website.

² An operational year will commence the first day of operations and continue for 12 months after that date. For instance, if operations start on 1 November 2020, the first operational year will be 1 November 2020 to 31 October 2021.