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Department of Planning, Infrastructure and Environment
Returned via Planning Portal

Attention: Ms Mazaheri
By email: Mandana.Mazaheri@planning.nsw.gov.au

22 May 2020

Dear Ms Mazaheri

Newcastle Power Station Project (CSSI 9837) Response to Submissions
Further Information Still Required by the Environment Protection Authority

I refer to your email to the Environment Protection Authority (EPA) received 1 May 2020, providing opportunity to comment on the Response to Submissions (RTS) in relation to the above proposed development. I also refer to the EPA's submission on 13 December 2019 advising that it would not be able to recommend conditions until additional information was provided on the assessment of air quality and noise impacts.

The proponent, AGL Energy Limited (AGL), proposes to construct a dual fuel power station, known as the Newcastle Power Station (NPS). The NPS, with gas pipelines, electricity transmission lines, site access and associated ancillary facilities would be built in Tomago in New South Wales (NSW). Together, the NPS, gas pipeline, electrical transmission lines and associated infrastructure form the Proposal.

The EPA has reviewed the *Newcastle Power Station Project - Environmental Impact Statement Submissions Report* (RTS) (dated April 2020) and supporting documents and has determined that not all of the information requested in the EPA's letter of 13 December 2019 has been provided. The EPA's additional information requirements are provided at Attachment A to this letter.

The EPA continues to be unable to recommend conditions for the proposal until the requested information is provided.

If you require any further information on this matter, please contact Genevieve Lorang on (02) 4908 6869 or by email to hunter.region@epa.nsw.gov.au

Yours sincerely

MITCHELL BENNETT
Unit Head – Regulatory Operations
Environment Protection Authority

Encl: Attachment A- further information Required

Phone 131 555
Phone 02 4908 6800
Fax 02 4908 6810
TTY 133 677
ABN 43 692 285 758
PO Box 488G
Newcastle
NSW 2300 Australia
117 Bull Street
Newcastle West
NSW 2302 Australia
info@epa.nsw.gov.au
www.epa.nsw.gov.au

Attachment A: Further Information Required by the EPA

The EPA requires clarification of the following points prior to considering whether to recommend conditions of approval.

Air Quality Impacts

1. **Benchmarking of emissions controls against best practice**

A report relating to detailed control technology and emissions performance benchmarking against additional jurisdiction guidance and experience is required. The benchmarking must describe and evaluate the full range of available emission control technologies and recommend what is feasible for application at the Newcastle Power Station. Where a technology or emission level is found to be not feasible, a detailed justification must be provided.

The EPA recommended that the preferred power station option and final design of emission controls proposed for implementation at the power station be benchmarked against international best practise technology and performance.

The revised AQIA has included an additional section on air emission controls. The European Commission's *Best Available Techniques (BAT) Reference Document for Large Combustion Plants* (IPPC 2017) has been referenced to benchmark emission control technologies and emission concentrations. For gas turbines, the three main techniques for NOx prevention or reduction are water/steam injection, dry low-NOx burners and catalytic solutions such as SCR.

Water injection technology is proposed for the gas turbine option. The proposed performance for NOx of the turbine is 51 mg/Nm^3 (@ 15 % O_2) for natural gas and 86 mg/Nm^3 for distillate. This is compared to expected emission levels (IPPC, 2017) of 25-50 mg/m^3 daily average for new gas turbines.

SCR is proposed for reciprocating engines. The proposed emission performance for the reciprocating engine for NOx is 150 mg/Nm^3 (@ 15 % O_2) (equivalent to 450 mg/m^3 @ 3% O_2) for both fuels. This is compared to emission levels (IPPC, 2017) of 147-380 mg/Nm^3 for gas and 1531-1751 mg/Nm^3 for distillate.

The RTS only considers a single reference (IPPC, 2017) and does not include a detailed benchmarking and evaluation of feasible emission controls for the Proposal as required.

The benchmarking of control technology and NOx emissions has not considered the application of best available technology and achievable emissions levels from experience in other jurisdictions. Given that NOx is an ozone precursor and that the proposed power station would be in an ozone non-attainment area, NOx emissions should be as low as reasonably and feasibly achievable. Further, as NOx is a precursor to secondary particle formation and the proposed power station would be in a $PM_{2.5}$ non-attainment area, NOx emissions should be as low as reasonably and feasibly achievable.

Achievable emission levels for NOx have been demonstrated to be significantly lower than those referenced and proposed in the RTS AQIA benchmarking. This is demonstrated in the AQIA's figure 6.3 which shows in stack NOx emissions, which are not necessarily best practice, are generally far less than 100 mg/m^3 (@ 15 % O_2) and therefore the proposed 150 mg/m^3 is not best practice (Figure 6.3 reproduced below).

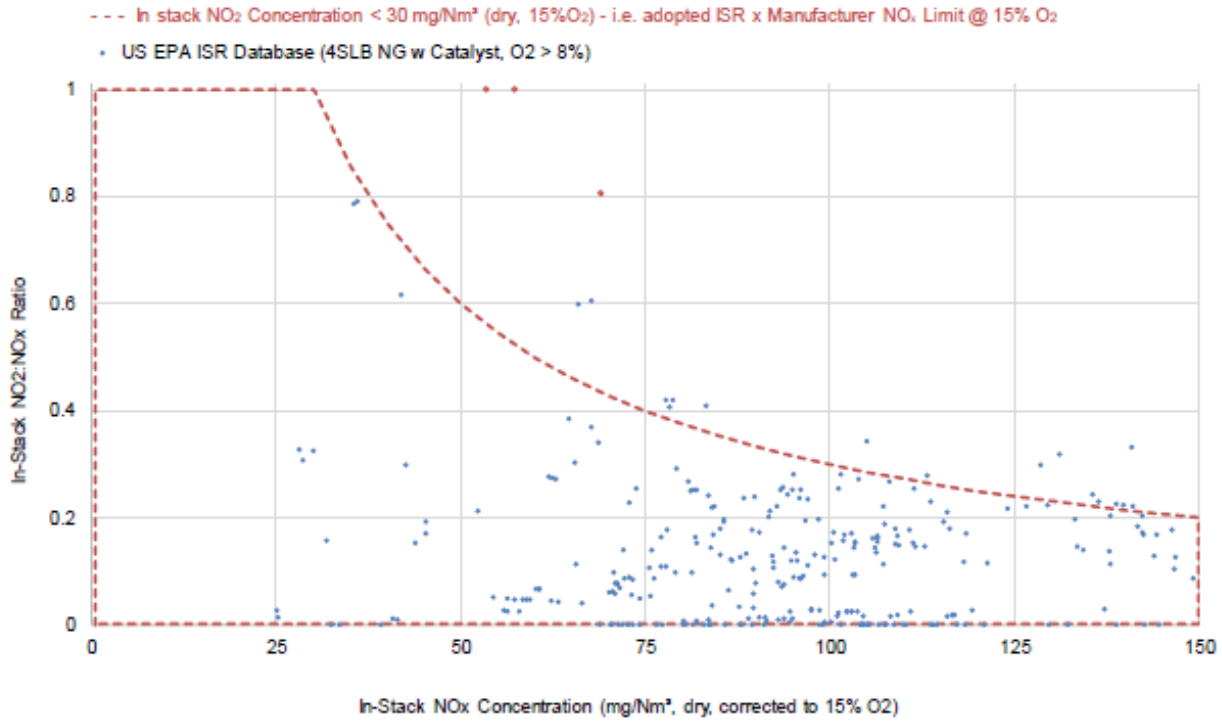

Figure 6.3: ISR vs in-stack NO_x concentration from filtered US EPA ISR database

Additional best available technology emissions limits are available for the US EPA and US state and district jurisdictions which include, but are not limited to: South Coast and Bay Area Air Quality Management Districts, California Air Resources Board and the US EPA's Clean Air Technology Centre.

NOx limits using best available technology are as low as 2 ppmv (~4 mg/m^3) @ 15 % O_2 for 1 hour. Examples of best available technology and emission limits currently in use are available at the following locations:

https://cfpub.epa.gov/rblc/index.cfm?action=Search.BasicSearch&lang=en
http://www.aqmd.gov/docs/default-source/bact/laer-bact-determinations/aqmd-laer-bact/part-b-section_1-2-1-19-combined-cycle-gas-turbine.pdf?sfvrsn=14)
http://www.aqmd.gov/docs/default-source/bact/laer-bact-determinations/aqmd-laer-bact/ic-engine-a-n-388869---bear-valley-electric.pdf?sfvrsn=0
http://www.aqmd.gov/docs/default-source/bact/laer-bact-determinations/other-laer-bact/partb_sec2_2-1-19_combined_turbine.pdf?sfvrsn=6
https://www.baaqmd.gov/~/media/files/engineering/bact-tbact-workshop/combustion/96-3-3.pdf?la=en
https://www.baaqmd.gov/~/media/files/engineering/bact-tbact-workshop/combustion/89-1-6.pdf?la=en
https://ww3.arb.ca.gov/energy/dg/guidance/gappb1.pdf?_ga=2.3364025.885341680.1589873613-929938400.1589873613

2) Ozone and inter-regional transport assessment

Further refined assessment and consideration is needed of the ozone exceedances for both turbines and reciprocating engines for 24 hours/day operation. This issue could be adequately addressed via commitment to additional emission control based on the benchmarking required under issue 1 (above) and in accordance with the BMP determination requirements of the EPA's *Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources.*

The EPA recommended the proponent conduct an ozone and inter-regional transport assessment. The ozone assessment must be conducted in accordance with *Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources.*

The revised AQIA has included an additional section on ozone assessment. The ozone assessment followed the NSW *Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources* to determine that as Newcastle region is in a non-attainment zone and NOx and VOC emissions exceed the threshold for both 14 % and 100 % operation scenarios a level 1 screening is required.

The assessment correctly states that the screening procedure is not ideally suited to a peaking plant with discontinuous operations. Nevertheless, the level 1 screening assessment shows that only the gas turbine operating for 6 hours a day was below the screening impact level of 0.5 ppb and the maximum allowable increment of 1 ppb. For all other proposed power station configurations and operating regimes, the impact assessment criteria was exceeded.

Instead of progressing to a level 2 ozone assessment, the revised AQIA considers previous studies on ozone and interregional transport, including:

- Impact of emissions from the proposed Tomago power station on photochemical smog in the greater Sydney region, Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2003.
- *Photochemical Pollution Assessment of a Proposed Gas-Fired Power Station at Munmorah*, CSIRO, September 2005, https://www.snowyhydro.com.au/wp-content/uploads/2015/02/Technical-Paper-5-Photochemical-Pollution-Assessment.pdf
- Report on the Assessment of Development Application No.165 05 2002-I Pursuant to Section 80 of the Environmental Planning and Assessment Act, 1979 Proposal by Macquarie Generation to Construct and Operate a Combined Cycle Gas Fired Power Station and Associated Infrastructure at Tomago, in the Port Stephens and Newcastle Local Government Areas, Department of Infrastructure, Planning and Natural Resources (DIPNR), October 2003, https://majorprojects.accelo.com/public/b6d46365f51674f664e366d52cdcce1a/Gas%20Fired%20Power%20Station,%20Tomago%20Assessment%20Report.pdf

The CSIRO (2003) study modelled potential smog generation for a 790 MW dual-fuel gas turbine plant in the Newcastle region. The studies on the proposed Tomago power station predicted net increases in ozone to be 0.2 %. The CSIRO (2005) study on the proposed 660 MW Munmorah gas turbine power on the Central Coast predicted no exceedances of NO_2 and O_3 standards.

These studies of ozone impacts from previously assessed power station proposals only include turbine plants and not reciprocating engines. The CSIRO (2005) report for the Munmorah power station ozone assessment was modelled for a turbine running on distillate with NOx emissions of 162.2 g/s and included the proposed Tomago power station with NOx emissions of 99 g/s in the scenario. In comparison, the AQIA models the emission rate for the proposed Newcastle power station of 56 g/s (14 g/s x 4 stacks) for gas turbine running on distillate and 84.5 g/s (6.5 g/s x 13 stacks) for reciprocating engine running on distillate.

The CSIRO (2005) modelling for ozone only included proposed power station NOx emissions and did not include power station VOC emissions. Additionally, the results of CSIRO (2005) indicate potential for exceedances of the maximum allowable increment (and screening impact level) under the EPA's *Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources,* at some locations in the modelling domain.

The revised AQIA has not updated these models for the current proposal or justified and validated the older models (and their associated emission inventories) used in these studies for the case of ozone formation for the proposed Newcastle Power Station. The conclusions drawn in the revised AQIA of the ozone impact from the proposal cannot be supported by the current level of information provided.

Only the proposed gas turbines when operating less than 6 hours/day are predicted to have ozone concentrations that will not exceed applicable assessment criteria. However, the proposed power station will be designed for continuous operation and therefore the proponent needs to consider potential secondary pollution formation, including ozone, in a non-attainment region should the proposed power station operate continuously in the future.

3. Assessment of emission variability, including start-up and shutdown emissions.

If the proponent wishes to gain approval to use diesel fired reciprocating engines, additional information must be provided, including revised assessment with the higher start-up emission and demonstration that emissions are being prevented and minimised.

The EPA recommended that the proponent prepare a revised assessment which adequately considers emission variability, including an assessment of emissions and impacts from plant start-up, shutdowns and variable load.

The revised AQIA includes a review of emissions from start-up and shutdown as an appendix.

The review of gas turbine start-up and shut down emissions indicate lower NOx and CO emissions than operation. Aeroderivative gas turbines of the scale proposed are capable of progressing from rest to full load on time scales in the order of 5 to 10 minutes. These durations include the period prior to ignition (e.g. purging of the turbine), and the time during which the turbines are ramping up to full output.

The review in the revised AQIA provides emission estimates from a California power plant proposal (CH2MHILL, 2010) for start-up and shutdown emissions for a gas-fired LM6000PC gas turbine, which is a water-injected aeroderivative turbine of the scale of those being considered for the Proposal. Over an 8-minute period (from ignition to 100% load), NOx and CO emissions were estimated at 3.5 and 3 pounds (lb) respectively, which equates to average emission rates of 3.3 and 2.8 g/s over this period. These emission rates are similar in scale (slightly lower) to operational NOx and CO emission rates of approximately 5.4 and 3.3 g/s. Over an 8-minute shutdown period, NOx and CO emission estimates are 2.7 and 2.4 lb (respectively), which are lower than those during operation, as well as those estimated over a corresponding 8-minute start-up period, and consequently of lesser significance than operational emissions.

The review of reciprocating engine start-up and shutdown indicate higher NOx and CO emissions than operation and longer start-up and shutdown periods than for a gas turbine, as reciprocating engines employ post-combustion controls (SCR and oxidation catalysts) which require additional time beyond the engine start-up to reach optimal operating conditions.

In the case of diesel operation, whilst the engines are capable of reaching full operating load in 5 minutes, elevated NOx emissions are estimated to continue for up to 30 minutes after commencement of start-up. The duration of this condition depends on the pre-starting temperature of the catalyst bed, which in turn is a function of time since the given unit was last operational.

The revised AQIA includes manufacturer estimates of NOx emissions for a start-up hour:

Table B.1: Comparison of Reciprocating Engine emissions under start-up and operation

Emission Scenario	NOx		CO		Units
	NG	DO	NG	DO	
Operation (full load)	22	23	6	6	kg/hr
Start-up	23	116	6	14	
Proportion: Start-up vs Operation	125%	573%	119%	252%	-

Based on the information presented, emission estimates for start-up and shutdown for natural gas for both the turbine and reciprocating engine are likely to be similar or less than operational emissions.

The start-up and shutdown emissions from distillate from reciprocating engines are likely to be significantly higher than normal operation and distillate from turbines are not provided but are proposed to be similar to operational emissions.

4. Verification of emissions

The proponent should model emissions based final design and emission specifications.

The AQIA has stated that emissions were either estimated from manufacturer data or USEPA AP-42 emission factors (Table 6.1) and given a summary of emission rates (Table 6.6) used in the

modelling to assess impacts. The EPA advised this is not sufficient information to audit and evaluate the emission rates used in modelling (Table 6.6).

The EPA requested a revised air quality assessment based on final plant design. As the emissions inventory is the foundation of the air quality assessment, a detailed discussion of the methodology used to calculate emission rates for each source was requested, including all supporting information such as manufacturer data where no measurements are available.

The EPA also recommended the proponent provide emission rates in both g/s and kg/yr in the emissions inventory.

The revised AQIA has included annualised emissions for all pollutants for both gas turbines and reciprocating engines running on each fuel type for both 14 % and 100 % operation.

5. Revised assessment of acrolein exceedances

If the reciprocating engine option is the preferred option, the proponent must consider additional controls and actions to reduce acrolein emissions and the potential for acrolein exceedances during operation.

The EPA requested that the assessment be revised to:

a) Benchmark the preferred project option against best practice process design and emission control
b) Robustly demonstrate that principal toxic air pollutants will be minimised to the maximum extent achievable
c) Refine the modelling assessment to demonstrate compliance with the impact assessment criteria set out in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*.

This was necessary because the proposed option of the reciprocating engine using natural gas exceeds the Impact Assessment Criteria (IAC) of 0.42 µg/m^3 for acrolein at the two nearest discrete receptors (0.68 µg/m^3) and beyond the boundary (1.25 µg/m^3).

The revised AQIA includes an analysis of the meteorological conditions that result in exceedances of the impact assessment criterion (IAC) of acrolein. Exceedances of 0.42 mg/m^3 IAC occur for 72 hours of the 8760 meteorological dataset (365 days) and occur:

- During daytime (8am-3pm) (70%)
- During neutral conditions (C & D class stability)
- With strong winds > 6.5 m/s (97 %)
- With moderate temperatures (10-30 °C)

The conditions that are associated with acrolein exceedances do not align with times the proposed plant is likely to operate as a peaking plant.

Noise Impacts

1. Demonstration that attenuated sound power levels can be achieved

The EPA requires demonstration that the adopted attenuated sound power levels are feasible and reasonable to achieve, and whether noise emissions from the proposal can be feasibly and reasonably made free of annoying noise characteristics including low-frequency and/or tonal modifying factors.

The EPA requested detailed information to demonstrate that the adopted attenuated operational sound power levels were feasible and reasonable to achieve, as well as a comprehensive assessment of the applicability of any annoying noise characteristics including low-frequency and/or tonal modifying factors. The EPA recognises that this is a significant infrastructure project and remains concerned about the potential for significant noise impacts, including low-frequency and tonal noise emissions, from facilities of this nature based on its past experience.

This information could be in the form of, but not limited to, manufacturer guaranteed sound power levels and spectra; or data from reviews of other existing power stations using similar technology, plant and equipment.

The proponent responded to these requests by stating that they are in a commercial tender process with multiple vendors for delivery of the project. The proponent advises that both attenuated sound power level data and spectral data for the project components are commercial-in-confidence and have not yet been provided by tenderers.

The proponent has stated that the tender process would require vendors to achieve the noise criteria in the Noise and Vibration Assessment (NVA) and be free of annoying characteristics to avoid tonal or low frequency noise penalties under the Noise Policy for Industry. These commitments do not, however, allow the EPA to assess whether the substantial operational noise attenuation factors adopted in the NVA, and penalty-free spectral noise emissions, are feasible and reasonable to achieve prior to any approval for the project, if granted.

The EIS therefore does not fulfil the requirements of the NSW Environmental Planning and Assessment Regulation (2000) Schedule 2 Part 7(1)(d)(iv) which states that an EIS must include "a full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment".

2. Other noise issues

1. The EPA recommends that the proponent adopt LAeq(15minute) descriptors for the Project Amenity Noise Levels in Table 5-3 and Table 5-4 of the NVA, in accordance with the process in Section 2.2 of the Noise Policy for Industry, to ease compliance assessment requirements and maintain consistency across receivers and time periods. The project noise trigger levels in Table 5-4 of the NVA should be revised to account for this change, and the assessment results and conclusions throughout the NVA should also be revised to account for this change.

2. The EPA notes that the project amenity noise criteria for receiver R4 have been revised following EPA's previous comments, however the 5 dB adjustment for a project based- criterion has been omitted and the R4 criteria are now 10 dB higher than for an equivalent residence. The project amenity noise criteria for R4 should thus be reduced by 5 dB to 60/50/45 (Day/Evening/Night).