APPLICATION TO VARY ENVIRONMENTAL PERMIT REFERENCE EPR/XP3538LD – SOUTH HOOK LNG TERMINAL

Supporting Information

JFR2006
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06 May 2022

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Document status

Version	Revision	Authored by	Reviewed by	Approved by	Review date
1	0	Tim Colebrook	n/a	n/a	11 April 2022
1	1	Tim Colebrook	Wayne Davies	n/a	12 April 2022
1	2	Tim Colebrook	Wayne Davies	Wayne Davies	12 April 2022
1	3	Tim Colebrook	SHLNG	n/a	21 April 2022
2	0	Tim Colebrook	Wayne Davies	Wayne Davies	29 April 2022
2	1	Tim Colebrook	SHLNG	n/a	05 May 2022
3	0	Tim Colebrook	Wayne Davies	Wayne Davies	12 May 2022

Approval for issue

Wayne Davies	Technical Director		12 May 2022

File Name

220512_R_JFR2006_TC_XP3538LD CEMS Permit Variation_Supporting Information_V3R0.docx

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South Hook LNG Terminal

EXECUTIVE SUMMARY

The South Hook Liquefied Natural Gas (SHLNG) Terminal is located near Herbrandston, in the county of Pembrokeshire.

As detailed in permit reference EPR/XP3538LD, the permitted activities for the installation allow the LNG Terminal to reheat LNG to produce natural gas with a target average natural gas send out capacity of 650 GWh per day, and with peak flow rate of 812 GWh per day. SHLNG operate under a different business model and in a different industrial context to other similar industrial sites

SHLNG undertakes the following activities that fall under the Environmental Permitting (England and Wales) Regulations 2016 (EPR) as follows:

- Section 1.1 A (1) (a): Burning any fuel in an appliance with a rated thermal input of 50 megawatts or more – Reheating LNG to produce natural gas with fifteen combustion units (aggregated to above 50 MWth).

Each combustion unit has a thermal input of 32 MWth, although having a total on-site installation of >50 MWth and classified for the section 1.1 combustion activity, the site is not classified as large combustion plant due to all SCVs being individual units with separate stacks (emissions points). This shall continue to be the case following this variation.

Proposed Variation

Continuous Environmental Monitoring System (CEMs) was not a legislative requirement at the time of permit, issue but was offered up as an additional compliance tool by the operator at the time. CEMs monitoring has been undertaken at the site since 2009 (2009 is when the Terminal commenced operation).

As detailed in the most recent permit variation (V004), an approved, permitted, proposed new SCV Installation at the site is classified as Medium Combustion Plant (MCP). Should the installation be permitted using current guidance and legislation, all the SCV's would be classified as MCP and therefore not be subject to a requirement for CEMs.

A review of monitoring data for emissions of NOx over the last 10 years has demonstrated that there have been no breaches of the emission limit value for the emissions from the SCVs.

Due to the excessive costs (detailed within this report) combined with the associated requirement to operate CEMS at sub-optimal design (due to permit requirement) and time required to maintain and replace the CEMs systems, SHLNG are proposing to remove the requirements for CEMs on the submerged combustion vaporiser (SCVs) and thus require this permit variation to remove this requirement.

The proposed variation does not increase the number of operating equipment items or change the permitted Emission Limit Values (ELVs). There will be no increase in send-out capacity above the level currently permitted of 812 GWh per day Peak Send Out capacity. The variation simply removes the requirement to continuously monitor NOx emissions from 2 No. of the installed SCVs (2 out of the current 16 permitted emission points).

The existing permit ELVs, including NOx concentration ELVs for emissions to air, will be retained to support required operations across the full range of production, from minimum to maximum send out, as currently permitted. Therefore, no relaxation (backsliding) of the current permitted ELV's is requested or proposed.

Environmental Impacts

The installation will continue to operate as is currently permitted and there will be no changes to its currently permitted activities.

The previously submitted assessments of emissions to air and to water for the installation remain valid. The Air quality modelling (AQM) assessment was modelled for 15 No. SCVs operating for a Peak Capacity Send Out.

Overall, there will be no increase in raw materials/energy usage at the facility from the changes as there will be no increase in operational capacity, the variation only removes the requirement for continuous emissions monitoring. Quarterly monitoring of NOx will continue as required. There will be an energy efficiency saving from not running the analysers and associated equipment.

Application forms and the installation OPRA profile are presented in Appendix A. Monitoring data is included in Appendix B. A quote for CEMs replacements and other relevant information is included in Appendices C to I.

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Appendices

1 INTRODUCTION

1.1.1 The South Hook LNG Terminal permitted installation is operated by the South Hook LNG Terminal Company Limited, in compliance with environmental permit reference EPR/XP3538LD. The LNG (Liquified natural Gas) Terminal receives stores and vaporises LNG to form natural gas for send out to the National Transmission System (NTS) operated by the National Grid (NG).

1.1.2 Following delivery, LNG is pumped from LNG ships moored at the jetty site into tanks where it is stored until it is re-gasified to meet specific grid demand. The LNG is converted back into natural gas through a process known as regasification.

1.1.3 Re-gasification of the LNG is currently achieved by operation of up to 15 No. submerged combustion vaporisers (SCVs), the number of SCV units operating at any given time being dependent on gas send-out nominations, operational and maintenance constraints.

1.1.4 Each SCV comprises a stainless-steel tube bundle immersed in a warm water bath. The LNG flows through the tube bundle and is heated and re-gasified by heat transferred from the water bath. The warm water temperature is maintained by supplying heat to the water in the SCVs through direct contact with hot gases resulting from the combustion of a small portion of the re-gasified natural gas produced at the LNG Terminal.

1.1.5 The natural gas produced, supplies the National Transmission System (a network of gas pipelines that transports gas throughout the UK). The South Hook LNG Terminal has a total processing capacity of 15.6 million tonnes per annum, which is equivalent to around 20% of the current UK natural gas demand. In Quarter 1 2022, SHLNG has supplied 52.5% of the UK's LNG market share. SHLNG is also classified as a key National Infrastructure installation.

1.1.6 SHLNG operate under a different business model and in a different industrial context to other similar industrial sites.

1.1.7 This document and its supporting appendices form the application to vary environmental permit reference EPR/XP3538LD.

1.2 Background

1.2.1 The South Hook LNG facility has been permitted since July 2004 and is currently permitted for the following activity:

- Section 1.1 A (1) (a): Burning any fuel in an appliance with a rated thermal input of 50 megawatts or more – Reheating LNG to produce natural gas with fifteen combustion units (aggregated to above 50 MWth).

1.2.2 The permit also allows the following directly associated activities (DAAs)

- Receipt and storage of LNG

1.2.3 This proposed variation does not change the permitted activity or require any additional activities to be permitted. Based on the requirements of the variation, it has been assessed that this will be a minor technical variation as there will be no requirement for any technical assessment by Natural Resources Wales (NRW) of any of the proposed changes to the site.

1.2.4 The variation seeks to permit the following changes:

- Removal of the requirements to continuously monitor 1 SCV in Train 1 and 1 SCV in Train 2.

1.2.5 There will be no changes to the number of installed SCVs operational at any one time and no change to emissions limit values. All operational SCVs will continue with quarterly 1h hourly monitoring for oxides of nitrogen.

1.3 The Site

1.3.1 South Hook LNG terminal is located at Dale Road, Herbrandston, Milford Haven, Pembrokeshire, SA73 3SU. The national grid reference for the installation is SM 8733 0638.

1.3.2 There are no changes to the site layout because of this permit variation.

1.4 Operator Details

1.4.1 The applicant and operator of the site is South Hook LNG Terminal Company Limited, registered on Companies House as company number 04982132 and whose registered office is South Hook LNG Terminal Company Ltd, Dale Road, Herbrandston, Milford Haven, Pembrokeshire, Wales, SA73 3SU.

1.5 Structure of the Application Document

1.5.1 Supporting information in this document is set out as follows:

- Section 2 provides an overview of the proposed changes to the activities that necessitate this permit variation;
- Section 3 provides evidence to support the removal of the CEMs systems;
- Section 4 summarises the changes detailed as part of the permit variation.
- Section 5 provides a summary of the conclusions

1.5.2 The information provided within this application has been set out with due regard to the Natural Resources Wales guidance[1]. Supporting documents, assessments and application forms are provided within the appendices list as set out in the contents page.

[1] https://naturalresources.wales/permits-and-permissions/environmental-permits/guidance-to-help-you-comply-with-your-environmental-permit/?lang=en

2 REQUIREMENTS OF THE VARIATION

2.1 Overview

2.1.1 As detailed in Table S3.1 of the site's Environmental Permit (reference EPR/XP3538LD), there is a requirement to continuously monitor emissions of NOx from one SCV on each train.

2.1.2 This has been a requirement since the installation was originally permitted in July 2004, however, this requirement was not included as a legislative requirement, it was included as an offer from the operator to demonstrate compliance of the emissions of NOx against the ELVs set for the installation.

2.1.3 This is confirmed in the permit determination decision document, which is included as Appendix F, where is it stated that '*the Applicant offered CEMS on two SCVs and quarterly for all SC*Vs'.

2.2 Removal of the CEMs NOx Monitoring Systems

2.2.1 It is proposed that the CEMs requirements be removed from the current permit requirements and that future monitoring requirements for NOx include quarterly monitoring for all available SCV's. Evidence to support this variation is included in Section 3 below.

2.2.2 Current monitoring arrangements include quarterly monitoring of SCV's for NOx and carbon monoxide in addition to the continuous monitoring of NOx. It is proposed to continue with quarterly monitoring of emissions to air.

3 EVIDENCE TO SUPPORT CEMS REMOVAL

3.1 Monitoring History and Compliance

3.1.1 CEMs systems have been installed since 2009 (Terminal Operational) when the permit was issued (2004) and continuous monitoring of NOx emissions to air has been undertaken since.

3.1.2 The CEMs systems have been part of a comprehensive preventative maintenance regime which has ensured that the ongoing monitoring of NOx has continued to be available to demonstrate compliance with the permitted emissions level of 107 mg/m^3 of NOx.

3.1.3 In addition to the CEMs, quarterly monitoring of emissions of NOx has been undertaken by the National Physical Laboratory (NPL) to support the CEMs monitoring.

3.1.4 NPL Quarterly monitoring data for the site since 2014 is included as Appendix B. A summary of quarterly monitoring data is included in Table 3.1 below:

Table 3.1: Quarterly Monitoring Data Summary (2014 – 21021)

Year	Quarter	Maximum Result (mg/Nm^3)	Average Result (mg/Nm^3)
2014	1	61.4	51.1
	2	84.6	58.3
	3	69.0	54.2
	4	85.1	65.5
2015	1	81.9	61.2
	2	76.5	60.6
	3	96.1	60.1
	4	92.1	60.9
2016	1	105.0	65.5
	2	90.7	61.0
	3	63.0	56.0
	4	49.4	46.9
2017	1	57.3	52.3
	2	71.7	61.2
	3	60.1	55.0
	4	62.2	55.4
2018	1	106.0	58.0
	2	56.6	46.2
	3	105.8	61.6
	4	58.2	52.6
2019	1	69.2	52.7
	2	58.2	53.0
	3	64.7	54.6
	4	55.5	53.9
2020	1	53.4	52.9
	2	70.4	57.7
	3	70.0	55.3
	4	54.5	51.0

Year	Quarter	Maximum Result (mg/Nm^3)	Average Result (mg/Nm^3)
2021	1	72.5	56.8
	2	90.3	64.5
	3	48.6	47.9
	4	74.7	58.3

3.1.5 Table 3.2 below details the maximum and average results for CEMS over the last 5 years. This data is collated from the annual reports submitted to NRW which are included as Appendix C.

Table 3.2: NOx CEMs Data (Annual Reports 2017 – 2021)

Emission Point	Emission Limit Value	Reference Period	Maximum Result (mg/Nm^3)	Average Result (mg/Nm^3)
Period from 01/01/2017 to 31/12/2017				
A8	107 mg/Nm^3	Continuous	54.3	49.2
A11		Continuous	73.0	55.2
Period from 01/01/2018 to 31/12/2018				
A8	107 mg/Nm^3	Continuous	Did not operate in 2018	Did not operate in 2018
A11		Continuous	63.5	50.5
Period from 01/01/2019 to 31/12/2019				
A8	107 mg/Nm^3	Continuous	74.2	56.5
A11		Continuous	62.0	53.7
Period from 01/01/2020 to 31/12/2020				
A8	107 mg/Nm^3	Continuous	64.7	51.5
A11		Continuous	74.7	53.4
Period from 01/01/2021 to 31/12/2021				
A8	107 mg/Nm^3	Continuous	91.9	66.3
A11		Continuous	80.7	61.5

3.1.6 In addition, CEMs data (24hr average) for 1st January 2020 – 31st December 2021 is included in Appendix B. A review of this data identifies that the daily mean readings for NOx emissions during this period were:

- SCV 1H (A8) Average NOx = 66.34 mg/m^3
- SCV 2A (A11) Average NOx = 61.52 mg/m^3

3.1.7 A review of all quarterly monitoring and CEMs data available over the last 10 years has not identified any breaches of the permitted emissions limit of 107 mg/m^3. It can be seen from the data in Table 3.1 that the average concentration for each of the last 5 years is below 70 mg/m^3.

3.1.8 NOx suppression using water abatement is fitted to all SCV's and this ensures that the temperature is controlled to minimise the generation of thermal NOx through appropriate temperature control.

3.1.9 The water suppression system uses a supply valve which has been quantified to achieve 99.9994% availability (as shown in NOx failure calculations in Appendix I), this means that the likelihood of a suppression system failure leading to an increase in NOx emissions is extremely low.

3.1.10 In addition to the inherent reliability of the NOx water suppression valves, process operators, twice daily undertake visual checks of the NOx suppression system to ensure that the abatement is working on SCVs that are running at the time. All checks are recorded in our Predix software (electronic operator rounds software)

3.1.11 In addition to the use of high-performance suppression systems and equipment, the water used for suppression is sourced from a reverse osmosis system thus giving a very pure water quality which minimises impurities which could lead to the build-up of deposits which would risk break down or clogging of the suppression system.

3.1.12 The above provides reassurance that the control of emissions of NOx from the SHLNG are well within the permitted ELV and thoroughly managed so that the risk of an elevated NOx emission is very low.

3.1.13 1-hour quarterly monitoring will continue to demonstrate compliance once the CEMs systems are removed.

3.2 CEMs Assessment

3.2.1 In 2021, it was identified that the currently installed CEMs are coming to the end of their operational life. This has been confirmed by the SHLNG engineering team due to the increase level of ongoing maintenance and repairs being undertaken to maintain the CEMs systems.

3.2.2 The costs to maintain the CEMs system during 2021 has been calculated to be £69,890 with the number of staff hours spent in maintenance and repair being 393 hours.

3.2.3 The amount of additional time which has been spent on maintenance since 2017 is included in the spreadsheets in Appendix G. This highlights the number of individual items specific to the CEMs and the SCVs with the CEMs systems installed, this has been shown to increase the time for maintenance as follows:

- 155.54% more corrective maintenance due to in part CEMS and continuous use (when compared to the other SCV's, without CEMS)).
- 117.47% more corrective maintenance on the SCVs due to having to continuously operate these SCV's ((when compared to the other SCV's, without CEMS).

  and

- 3386.84% more corrective maintenance for the NOx systems itself due to the continuous operations

3.2.4 For the year 2021, 393 hours of staff time was taken up on corrective and preventative maintenance of the CEMs systems. This equates to 20% of one I&C Technicians time spent solely on the CEMs systems in 2021. This is not practicable for SHLNG to sustain long term.

3.2.5 In addition to the above increase in maintenance, there is also a requirement to maintain an increased stock of spare parts to use for maintenance and repairs in the warehouse at SHLNG. A stock list required to be kept on site is included in Appendix G, this amounts to ~£40,000 of stock being stored on site to ensure that the CEMs can be maintained.

3.2.6 The costs to replace the CEMs systems has been quoted as up to £191,327.71, excluding costs of project management A copy of the quote has been included as Appendix D.

3.2.7 Should the requirements for the CEMs be removed, the staff time and costs currently spent on CEMs maintenance and repair would be allocated to other environmental improvements.

3.2.8 SHLNG at the time of writing have requested to vary their Greenhouse Gas (GHG) permit to be able to utilise Boil Off Gas (BOG) as fuel gas. This project has similar financial costs associated with it (compared to the NOx upgrade project), however, has many environmental advantages. For example, improving the Terminals resilience at minimum send out (MSO), eliminate the possibility

of flaring at MSO, reduce CO_2 emissions due to the composition of BOG and reduce electrical energy requirements at MSO.

3.2.9 The advantages of being able to use the approved finance of the NOx upgrade to fund the use of the BOG as Fuel gas upgrade are summarised in the letter included in Appendix E and summarised below.

1. BOG as fuel gas has proven to maintain SHLNG's BOG pressure significantly lower than on our standard MSO operation when corrected for atmospheric pressure. This maintains the stability, and resilience, of the plant and reduces the probability of flaring by reducing the probability of a plant upset during periods of MSO.
2. The use of BOG as Fuel Gas improves reliability by reducing the impact of variable atmospheric pressures, which directly affects our BOG pressure and terminal stability. This directly improves process safety and supplier reliability to the national grid.
3. In addition, in this mode of operation, SHLNG do not require the use of Fuel Gas heaters (electrical consumption 627kWh) which further reduces the Process safety risk from heater incidents and has the secondary advantage in energy savings.

3.2.10 Furthermore, SHLNG are evaluating through the trial, any wider efficiencies through the plant process (e.g., compressor operation philosophy), and potential for NOx reduction due to the composition of BOG.

3.2.11 SHLNG have approved the finance for using BOG as fuel gas, however at the time of writing, this is not scheduled in in the 2022 financial year thus pushing this project out by at least a year. If the already agreed finances for the NOx upgrade could be used for the BOG as fuel gas project instead this would be advantageous to SHLNG overall environment resilience at MSO.

3.3 SCV Design and Utilisation

3.3.1 Due to the current set-up with CEMs installed on one SCV on each train, there is a requirement to run the SCVs linked to the CEMs systems continually to be able to provide CEMs data. This has the effect of not being able to operate the plant as efficiently as designed.

3.3.2 From a reliability and safety perspective our Operations Team are encouraged to run SCV 1H and SCV 2A if available, at all times (continuously). If SCV1A or SCV 2A have very minor malfunctions, not optimal, but still operate safely, the Operations team will run these SCV's. Under these circumstances, other SCV's which are "healthier" may not then be run, due to the permit conditions. From an equipment strategy viewpoint our Operations Team would prefer to balance hours of all SCV's but cannot.

3.3.3 During minimum send-out when the terminal is operating at lowest utilisation, it is not always possible to run the SCV's connected to the CEMs and therefore it is not always possible to achieve the required permit compliance in continuous emissions monitoring.

3.3.4 At all other times, the SCV's linked to the CEMs system are running when send-out and utilisation allows.

3.3.5 Selas Linde (SCV manufacturers) have guaranteed the SCV's will achieve a NOx emission level of 85 mg/m3 or below during normal usage, however, due to the requirement to operate the two SCV's with CEMS continuously to provide monitoring data, this increases the risk of abnormal emissions and breakdown of these SCVs due to the additional usage and loading not required of the other SCVs at the site.

3.3.6 The removal of the CEMs requirements would allow SHLNG to operate the SCVs and manage the send-out more effectively, spreading the SCV usage more evenly and thus reducing the risk of breakdown and abnormal emissions from the terminal.

3.4 Current Legislative Requirements

3.4.1 As detailed in the most recent permit variation (V004), a proposed newly installed SCV at the site is classified as Medium Combustion Plant (MCP)[2]. Should the installation be permitted using current guidance and legislation, all the SCV's would be classified as MCP and therefore not be subject to a requirement for CEMs.

3.4.2 The current MCP requirements are a NOx limit of 100 mg/m^3, with monitoring requirements of every year for medium combustion plants with a rated thermal input greater than 20 MW.

3.4.3 SHLNG propose to continue with quarterly monitoring of NOx emissions which is an increased frequency on the current requirements for monitoring of MCP.

3.5 Monitoring of Emissions to Air and Water from IED Installations Guidance

3.5.1 The JRC Reference Report on Monitoring (ROM) summarises information on the monitoring of emissions to air and water from IED installations, thereby providing practical guidance for the application of the BAT conclusions on monitoring in order to help competent authorities to define monitoring requirements in the permits of IED installations.

3.5.2 A review of the JRC Reference Report on Monitoring of Emissions to Air and Water from IED Installations[3] identifies a risk-based approach for determining an appropriate monitoring regime. The JRC report states "It is best practice to assess the overall risk posed by the (potential) emissions from an installation to the environment and to match the frequency and scope of the monitoring regime to this risk".

3.5.3 This risk-based approach identifies risk factors to be considered as follows:

- the size and type of the installation, which may determine its environmental impact;
- the complexity of sources (number and diversity, source characteristics (e.g. area sources, channelled emissions, peak emissions));
- the complexity of the process, which may increase the number of potential malfunctions;
- the frequency of process switching, particularly at multi-purpose chemical plants;
- possible hazards posed by the type and amount of input feedstock and fuel materials;
- possible environmental and human health effects resulting from emissions, taking into
- account the pollutant types and their rates of release, and including the potential failure of abatement equipment;
- the stability of the emission;
- the proximity of the emission source to sensitive environmental receptors;
- the presence of natural hazards, such as geological, hydrological, meteorological or marine factors;
- past performance of the installation and its management;
- the degree of public concern, particularly with regard to contentious installations.

[2] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L2193&from=EN

[3] https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-12/ROM_2018_08_20.pdf

3.5.4 An assessment of the risk of the NOx emissions from the SHLNG terminal is considered in Table 3.3 below:

Table 3.3: SHLNG Risk Factors

Risk Factor	Low Risk	Medium Risk	High Risk
Risk factors influencing the likelihood of exceeding the ELV			
Number of individual sources contributing to the emission	Single	Several (2 to 5)	Numerous (> 5)
Stability of operating conditions	Stable	Occasionally unstable	Unstable
Potential for mechanical failure due to corrosion	No or limited corrosion	Normal corrosion, covered by design	Corrosion conditions still present
Flexibility in product output	Single dedicated production unit	Limited number of product grades	Many product grades, multipurpose plant
Inventory of hazardous substances	Not present or production-dependent	Significant (compared to ELV)	Large inventory
Maximum possible emission load (i.e. concentration × flow rate)	Significantly below the ELV	Around the ELV	Significantly above the ELV
Risk factors influencing the consequences of exceeding the ELV			
Duration of potential failure	Short (< 1 hour)	Medium (1 hour to 1 day)	Long (> 1 day)
Acute effect of the substance(s)	No	Potential	Likely
Location of the installation	Industrial area	Safe distance between industrial and residential areas	Residential area nearby

3.5.5 As can be seen from the above, all other the factors assessed apart from number of sources are rated as low. The number of sources i.e individual SCVs is >5*, however, these are all subject to ongoing preventative maintenance and therefore the risk is lowered due to the systems in place.

*For SHLNG to utilise 100% availability we are required to run 11 SCV at all times (having currently four spare). In reality and based on past utilisation of equipment on site, SHLNG utilisation capacity in 2021 was 33% or approx. 4 SCV running on average. In 2020 SHLNG utilisation was 46%, i.e. 5 SCV running on average. On average over the past 10 years SHLNG has utilised 4.1 SCV placing SHLNG at a medium risk in accordance with the JCR report. See table below. Even though SHLNG has currently 15 operational SCV's (16 permitted) on average, over the last 10 years, we have utilised 4 SCV's. This is part of the Terminals N+1 philosophy to ensure we can reliably deliver energy to the UK, when required.

Table 3.4: SCV Utilisation

Year	% Utilisation	Equivalent Number of SCVs/Year
2014	44.3	4.9
2015	53.7	5.9
2016	39.5	4.3
2017	22	2.4
2018	11.4	1.3
2019	42.9	4.7
2020	46.4	5.1

2021	33.3	3.7
Average number of SCV utilised per year since 2014		4.0

3.5.6 Based on the above, the likelihood and consequences of exceeding the ELV is low. This is further demonstrated in Section 3.1 by the evidence to demonstrate there have been no breaches of ELVs identified in the last 10 years of monitoring.

3.5.7 Taking the above into account and reviewing the guidance document, based on this assessment, it would be considered that the monitoring of emissions would be occasional or regular as described below:

- **Occasional** - periodic measurements once every three years up to once per year, possibly accompanied by indicative monitoring between measurements.
- **Regular (to frequent)** - periodic measurements once per year up to twice per year, possibly accompanied by indicative monitoring between measurements.

3.5.8 The proposed monitoring regime upon removal of CEMs would be to continue with quarterly monitoring which would demonstrate a more frequent basis that that concluded from the risk-based approach above.

3.6 Management Systems

3.6.1 The LNG Terminal operates integrated management systems (which include environmental management systems) and these or equivalent systems will remain in place, subject to updates because of this variation and future continual improvement.

3.6.2 South Hook LNG Terminal has a management system (SHEMS) which is fully aligned with ISO 14001. SHEMS is the subject of periodic audits by external third parties, including NRW.

3.7 Operations and Maintenance

3.7.1 It is not anticipated that the removal of the CEMs will have the potential to present any unacceptable risk to the local environment as there will be no change to the impacts from the currently permitted operations. Where there is the potential for a significant environmental impact, systems (including where appropriate operational and/or maintenance procedures) have been put in place to ensure that the environmental effect is appropriately managed, avoided or where this is not possible, that it is minimised.

3.7.2 A preventative maintenance programme exists for the LNG Terminal that ensures plant is regularly maintained and serviced as required. This process and related documentation will ensure that all SCVs continue to be maintained in accordance with the manufacturer's guidance.

3.7.3 The removal of the CEMs will allow time previously spent in maintaining the CEMs to be spent on maintenance and further environmental improvements in other parts of the site operations, improving the overall environmental compliance.

3.8 Competence and Training

3.8.1 Operational staff at the LNG Terminal are fully trained in the systems and procedures for operating the SCVs and the actions to be taken in the event of an unexpected or abnormal operating condition and/or emergency.

3.8.2 Operational staff will be made aware of any changes to operations that result from the proposed removal of the CEMs.

4 CHANGES TO PERMITTED ACTIVITIES APPLICATION SUMMARY

4.1 Changes to Existing Permitted Activities

4.1.1 There are no changes to the permitted activities or directly associated activities as a result of the permit variation. The permitted activities will remain as follows:

- Section 1.1 A (1) (a): Burning any fuel in an appliance with a rated thermal input of 50 megawatts or more – Reheating LNG to produce natural gas with fifteen combustion units (aggregated to above 50 MW_{th}).
- DAA - Receipt and storage of LNG

4.1.2 In summary, the changes subject to this variation application are to remove the requirement for CEMs and continue with quarterly monitoring.

4.1.3 This will require an update to the Table S3.1 (Point source emissions to air – emissions limits and monitoring requirements) as detailed in Table 4.1and Table 4.2 below:

Table 4.1: Current Table S3.1 Point source emissions to air – emissions limits and monitoring requirements

Emission point ref. & location	Source	Parameter	Limit	Reference period	Monitoring frequency	Monitoring standard
A1 – A8 A11 – A17 [Points A1 – A8 and A11 – A17 as detailed on site plan in Schedule 7)	Submerged Combustion Vaporisers	Oxides of Nitrogen (NO and NO2 expressed as NO2)	107 mg/m3	~~Daily mean (1 SCV in Phase 1 and 1 SCV in Phase 2 only)~~	~~Continuous (1 SCV in Phase 1 and 1 SCV in Phase 2 only)~~	~~EN 15267-3 In respect of QAL 1 only BS EN 14181 (1 SCV in Phase 1 and 1 SCV in Phase 2 only)~~
				One hour sample	Quarterly	BS EN 14792
		Carbon monoxide	No limit set	Not specified	Quarterly	BS EN 15058
A18 [Point A18 as detailed on site plan in Schedule 7]	Submerged Combustion Vaporiser MCPD Identifier 44-E6901 H	Oxides of Nitrogen (NO and NO2 expressed as NO2)	100 mg/m3	One hour sample	Quarterly	BS EN 14792
		Carbon monoxide	No limit set	Not specified	Quarterly	BS EN 15058
A21 – A146	No Change					

Table 4.2: Updated Table S3.1 Point source emissions to air – emissions limits and monitoring requirements

Emission point ref. & location	Source	Parameter	Limit	Reference period	Monitoring frequency	Monitoring standard
A1 – A8 A11 – A17 [Points A1 – A8 and A11 – A17 as detailed on site plan in Schedule 7)	Submerged Combustion Vaporisers	Oxides of Nitrogen (NO and NO2 expressed as NO2)	107 mg/m3	One hour sample	Quarterly	BS EN 14792
		Carbon monoxide	No limit set	Not specified	Quarterly	BS EN 15058
A18 [Point A18 as detailed on site plan in Schedule 7]	Submerged Combustion Vaporiser MCPD Identifier 44-E6901 H	Oxides of Nitrogen (NO and NO2 expressed as NO2)	100 mg/m3	One hour sample	Quarterly	BS EN 14792
		Carbon monoxide	No limit set	Not specified	Quarterly	BS EN 15058
A21 – A146	No Change					

5 CONCLUSIONS

5.1.1 CEMs system for NOx emissions has been in place and monitoring undertaken since the permit was issued in July 2004 and the site became operational in 2009.

5.1.2 CEMs was not a legislative requirement at the time of permit issue and is still not a legislative requirement for MCP. It was included as an offer from the operator to demonstrate compliance of the emissions of NOx against the ELVs set for the installation. SHLNG has quantified, in this report, and has demonstrated full compliance with our set ELV's, thus achieving the original intent of the CEMs.

5.1.3 A review of available monitoring data over the last 10 years demonstrates that there have been no identified breaches of the emissions limit values for NOx (107 mg/m3) either through the CEMs systems or through the quarterly third-party MCerts monitoring.

5.1.4 10 years of monitoring data provides comprehensive lines of evidence that the plant is well maintained and operated and is unlikely to result in any future non-compliances which would not be identified through the robust managements systems and procedures in place which would be supported by the quarterly monitoring.

5.1.5 It has been quantified that the current permit requirement to have SCV with CEMs operational has increased the maintenance time (downtime) of these 2 SCV's in comparison with other SCV's.

5.1.6 The staff time and maintenance costs currently dedicated to the running of the CEMs would be more appropriately spent and utilised on continuous environmental improvements.

5.1.7 In terms of reliability our Operations Team/Technical Services Team would prefer to balance hours of all SCV's but cannot. As outlined above in Section 3.5.5, historically SHLNG utilise, on average, 4 SCV's, two of which are to be run continuously when possible.

5.1.8 Using the BAT reference, JRC Reference Report on Monitoring of Emissions to Air and Water from IED Installations identifies a risk-based approach for determining an appropriate monitoring regime. Using this risk-based approach, it is found that the appropriate monitoring regime for the SHLNG would be regular (periodic measurements once per year up to twice per year, possibly accompanied by indicative monitoring between measurements) monitoring is required. The currently utilised quarterly monitoring proposed is more than that recommended by the risk assessment

5.1.9 The removal of the CEMs system is not classed as backsliding as there would be no change in the ELVs for NOx emissions from the site. In 2025, the operator will be required to vary the permit to include lower ELV's of 100 mg/m^3 as required by the Medium Combustion Plant Directive. The current monitoring data provides evidence that the current emissions would be able to comply with this lowering of the ELV without any changes or further abatement of the emissions required.

GLOSSARY

BAT – Best Available Technique

BOG – Boil Off Gas

BREF – BAT Reference

ELV – Emissions Limit Values

EMS – Environmental Management System

EPR - Environmental Permitting (England and Wales) Regulations 2016, as amended

GHG – Greenhouse Gas

IED – Industrial Emissions Directive

JRC – Joint Research Centre

LNG - Liquefied Natural Gas

MCP – Medium Combustion Plant

MSO – Minimum Send Out

NG - National Grid

NTS - National Transmission System

NPL – National Physics Laboratory

NRW - Natural Resources Wales

NO_x – Oxides of Nitrogen

OEM – Original Equipment Manufacturer

ROM – Report on Monitoring

SHEMS – Safety, Health and Environment Management System

SHLNG - South Hook Liquefied Natural Gas Terminal Co Ltd

SCV - Submerged Combustion Vaporiser

REFERENCES

- NRW How to Comply Guidance - https://naturalresources.wales/permits-and-permissions/environmental-permits/guidance-to-help-you-comply-with-your-environmental-permit/?lang=en
- Medium Combustion Plant Directive - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L2193&from=EN
- JRC Reference Report on Monitoring of Emissions to Air and Water from IED Installations - https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-12/ROM_2018_08_20.pdf

Appendix A
APPLICATION FORMS & OPRA

Appendix B
MONITORING DATA

Appendix C
ANNUAL REPORTS

Appendix D
CEMS QUOTES

Appendix E
BOG AS FUEL GAS

Appendix F
PERMIT APPLICATION DECISION DOCUMENT

Appendix G
ADDITIONAL SCV MAINTENANCE AND STOCK ITEMS

Appendix H
CHANGE REQUEST FORM

Appendix I
ABATEMENT SYSTEMS

APPLICATION TO VARY ENVIRONMENTAL PERMIT REFERENCE EPR/XP3538LD - SUPPORTING INFORMATION

South Hook LNG Terminal

2022-04-29

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