

ENVIRONMENTAL PERMIT APPLICATION

Hem Heath Electricity Generation Site

Non-Technical Summary

Prepared for: Infinis Energy Services Limited

Client Ref: 402.01428.00043

SLR Ref: 416.01428.00043_Hem_Heath_NTS
Version No: DRAFT v3
December 2018



BASIS OF REPORT

This document has been prepared by SLR Consulting Limited with reasonable skill, care and diligence, and taking account of the manpower, timescales and resources devoted to it by agreement with Infinis Energy Services Limited (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

SLR shall not be liable for the use of or reliance on any information, advice, recommendations and opinions in this document for any purpose by any person other than the Client. Reliance may be granted to a third party only in the event that SLR and the third party have executed a reliance agreement or collateral warranty.

Information reported herein may be based on the interpretation of public domain data collected by SLR, and/or information supplied by the Client and/or its other advisors and associates. These data have been accepted in good faith as being accurate and valid.

The copyright and intellectual property in all drawings, reports, specifications, bills of quantities, calculations and other information set out in this report remain vested in SLR unless the terms of appointment state otherwise.

This document may contain information of a specialised and/or highly technical nature and the Client is advised to seek clarification on any elements which may be unclear to it.

Information, advice, recommendations and opinions in this document should only be relied upon in the context of the whole document and any documents referenced explicitly herein and should then only be used within the context of the appointment.

CONTENTS

1.0 INTRODUCTION	1
1.1 Site Location.....	1
1.2 Consultations with the Environment Agency (EA)	1
2.0 APPLICATION OVERVIEW	3
2.1 Regulated Activities.....	3
2.1.1 Specified Generators.....	3
2.1.2 Medium Combustion Plant.....	3
3.0 APPLICATION CONTENTS	5
3.1 Application Forms.....	5
3.2 Air Emissions Risk Assessment	5
3.3 Drawings	5
3.4 Application Fee	5
4.0 TECHNICAL STANDARDS AND KEY CONTROL MEASURES.....	6
4.1 Technical Standards	6
4.2 Key Control Measures.....	6
4.3 Compliance with NOx ELV.....	6
4.3.1 NOx Formation & Primary Control Measures.....	6
4.3.2 Engine Maintenance.....	7
4.3.3 Achievable NOx Emission Concentrations.....	7
5.0 CONCLUSIONS.....	8

DRAWINGS

DRAWING: Hem_Heath_EP1 Site Layout and Installation Boundary

APPENDICES

APPENDIX A: Compliance with NOx ELV Supporting Data

1.0 INTRODUCTION

SLR Consulting Ltd (SLR) has been instructed by Infinis Energy Services Limited (Infinis) to prepare an environmental permit (EP) application for Medium Combustion Plant (MCP) and a Specified Generator (SG) for an existing energy generation facility operated by Regent Park Energy Limited (Regent), located on the Stanley Matthews Way, Stoke on Trent, ST4 8GR, hereafter referred to as 'the Site'.

This Non-Technical Summary (NTS) provides a summary of what is being applied for, the regulated facility and outlines the key technical standards and control measures that will be implemented at the Site as a result of the risk assessments.

In addition to this NTS, the EP application comprises the following documents:

- Section 1 - Application Forms;
- Section 3 – Air Emissions Risk Assessment; and
- Section 4 – Drawings.

1.1 Site Location

The Site is located within an industrial area in the south of Hem Heath and falls within the administrative area of Stoke on Trent City Council. The locale of the Site can be characterised by the following:

- Industrial and commercial land use to the north and east for over 500m;
- Industrial and commercial land use to the west, beyond which lies agricultural land and residential dwellings within 400m to the southwest; and
- To the south, residential development has been consented (and is being built out) to within 35m of the Site.

The Site is within Stoke on Trent AQMA. The AQMA was declared due to exceedences of the annual and hourly AQO for NO₂ and can be described as "*an area encompassing the whole city of Stoke-on-Trent*". The main source of pollution has been deemed as road traffic. The Site is not in proximity (within 1km) to any such areas with the A50 over 1km to the north and therefore baseline NO₂ concentrations are anticipated to be close to 'background' concentrations.

There are no other known specified generator arrays operating more than 50 hours per year within 1km of the Site.

There are no Sites of Special Scientific Interest (SSSI) within 2km of the Site or any Special Protection Areas (SPA), Special Areas of Conservation (SAC) or Ramsar sites within 10km of the Site.

The site layout and engine locations are illustrated on Drawing Hem_Heath_EP1.

1.2 Consultations with the Environment Agency (EA)

Infinis has been tracking the Medium Combustion Plant Directive (MCPD) EU/2015/2193 and its transposition for some time. With the acquisition of Alkane Energy in April 2018, it has been liaising with the EA to obtain clarity upon the requirements. In obtaining pre-application advice, Infinis has exchanged questions and answers by email with the following EA officers:

- Ms Vicky Hind, Senior Technical Officer (Energy Efficiency) - Medium Combustion Plant (MCPD);
- Ms Miriam Townshend, National Permitting Service;
- Ms Emma Pemberton, National Permitting Service; and
- Mr John Henderson, Policy Advisor, Fuel and Power.

Infinis has referred to the following link (accessed on and before 23 November 2018) which provides the Landing Page document to assist applicants in the MCP/SG application process: <https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/>

Infinis has also made representations to the EA at national level. Whilst continuing to seek clarity upon requirements and obligations under the Permit, Infinis has decided to make Permit applications for what it considers to be relevant sites in 2018.

2.0 APPLICATION OVERVIEW

2.1 Regulated Activities

The generators comprising the Hem Heath Electricity Generation Plant are summarised in Table 2 overleaf.

The proposed facility requires an environmental permit by the Environmental Permitting (England and Wales) (Amendment) Regulations 2018 (EPR 2018).

2.1.1 Specified Generators

The plant comprises a 'Specified Generator' (SG) as defined in Schedule 25B of the EPR 2018. This is because the plant has an aggregated rated thermal input equal to or greater than 1MWth but less than 50MWth (9.68MWth) and the plant is used for the purpose of generating electricity.

As can be seen from the information in Table 1, Engine 1 is a Tranche B generator on the basis that it has a Capacity Market Agreement arising from a post-2016 Capacity Market Auction. Engine 2 however is a Tranche A generator on the basis that it benefits from a Capacity Market Agreement from the 2014 Auction.

As such, the plant is required to obtain an environmental permit by the 1st January 2019 however each engine will have different compliance dates. Engine 1 will need to comply with the oxides of nitrogen (NOx) Emission Limit Value (ELV) from 1st January 2019 whereas Engine 2 will have until 1st January 2025 to comply with the NOx ELVs, unless a new supply contract is entered in to.

2.1.2 Medium Combustion Plant

In addition, the plant comprises two Medium Combustion Plant (MCP) as defined by Schedule 25A of the EPR 2018. This is because the each generator has a rated thermal input equal to or greater than 1MWth but less than 50MWth.

The generators are classed as 'existing' MCP on the basis that they have been in operation prior to the 20th December 2018.

As existing MCP with individual thermal input capacity below 5MWth the plant are not required to obtain an environmental permit until 1st January 2029.

The relevant MCP permitting dates are identified in Table 1 below:

Table 1 MCP Permitting Dates

Engine identifier	Operational commencement date	Calculated thermal input (MWth)	MCPD Permitting date
1	Pre-20 th December 2018	4.84	By 1 st January 2029
2	Pre-20 th December 2018	4.84	By 1 st January 2029

Table 2 Hem Heath Generator Details

Engine identifier	National grid reference	Fuel type	NACE Code	Actual Electrical output (MWe)	Calculated thermal input (MWth)	Average Load (%)	Operational commencement date	Capacity balancing market agreements /	Annual operating hours
1	SJ 88329 42380	Natural gas	3511	1.95	4.84	100	Pre-1 st December 2016	Capacity Market agreement from a post-2016 CM auction	Up to 8,760
2	SJ 88336 42381	Natural gas	3511	1.95	4.84	100	Pre-1 st December 2016	Capacity Market agreement from a 2014 auction	Up to 8,760
Total	N/A	N/A	N/A	3.90	9.68	N/A	N/A	N/A	N/A

3.0 APPLICATION CONTENTS

3.1 Application Forms

Application forms have been completed and are enclosed in Section 2 of the application.

3.2 Air Emissions Risk Assessment

An Air Emissions Risk Assessment (AERA) was undertaken by SLR (ref. 402.01428.00043).

The risk assessment comprised a screening assessment utilising the EA's 'Air Emission Risk Assessment' guidance and the application of 'dispersion factors' generated by the EA for landfill gas (LFG) engines. The application of these 'dispersion factors' is considered to be appropriate as the actual engines and dispersion characteristics are comparable as the SG's were previously used as LFG engines and no heat recovery is applied. The application of the EA's AERA LFG engine 'dispersion factors' has been agreed with the EA as a suitable alternative methodology to the EA's 'Specified Generator Tranche B Screening Tool'.

The SG passed the screening assessment and as such is eligible to apply for a 'simple bespoke' environmental permit. The AERA is enclosed in Section 3 of the application.

3.3 Drawings

The following drawings have been prepared for the Site:

- Drawing Hem_Heath_EP1 Site Layout and Installation Boundary

The drawings are enclosed in Section 4 of the application.

3.4 Application Fee

On the basis of the application being classed as 'simple bespoke', an application fee of £2,028 has been determined in accordance with the EA's Environmental Permitting Charging Scheme (2018).

4.0 TECHNICAL STANDARDS AND KEY CONTROL MEASURES

4.1 Technical Standards

Key technical standards laid out in the following documents govern the design and operation of the plant:

- EA - Interim Medium Combustion Plant Guidance (November 2018);
- EA - Interim Specified Generator Guidance (November 2018); and
- EA – M5 Monitoring of stack gas emissions from medium combustion plants and specified generators (Version 1, September 2018).

4.2 Key Control Measures

Key control measures that will be applied at the Site are as follows:

- Lean burn or enhanced lean burn will be employed as necessary to minimise NO_x emissions;
- Emissions to air are discharged through a stack terminating at 5.25m (above ground level) to aid atmospheric dispersal;
- An engine control system is employed which allows Alkane to:
 - monitor engine performance;
 - control air-fuel ratio;
 - actively and reactively control load;
 - meter power;
 - manage engine speed;
 - control voltage; and
 - remotely control the system.
- A preventative maintenance schedule is implemented; and
- Emissions to air will be monitored periodically to ensure compliance with limits are achieved.

4.3 Compliance with NO_x ELV

4.3.1 NO_x Formation & Primary Control Measures

There are three ways in which NO_x may be formed during combustion:

- Thermal NO_x. Oxidation of nitrogen in air during combustion. Formation takes place significantly above 1300°C, with concentrations rising exponentially with temperature;
- Fuel NO_x. Oxidation of nitrogen in fuel during combustion; and
- Prompt NO_x. Reaction of atmospheric nitrogen with carbon and hydrogen radicals. Concentrations increase in proportion to temperature but are low when compared with thermal and fuel NO_x.

In terms of the potential for NO_x generation during the combustion of potential gaseous fuels (i.e. natural gas, propane, coal mine methane, landfill gas) in spark ignition engines, the absence of any significant quantities of nitrogen in the fuel means that the formation routes are limited to 'thermal' and 'prompt'; with 'thermal' being the predominant contributor.

The generator employs a lean burn combustion control system and delayed ignition timing which means that combustion takes place in conditions of excess air; the resulting reduction in combustion temperatures leading to a reduction in thermal NO_x formation.

The lean burn system allows the generators to be monitored and tuned to differing fuel types (i.e. methane content or propane) to ensure ongoing combustion efficiency and minimisation of NO_x formation.

4.3.2 Engine Maintenance

As a power generator, Infinis adopts an operational philosophy aimed at optimising the reliability and performance of its assets. All of Infinis' generating equipment is subject to rigorous maintenance and overhaul regimes, carried out by its team of in-house engine technicians and engineers.

A 'state-of-the-art' 24/7 logistics centre at its Northampton head office uses the latest technology to optimise the use of its resources and the performance of its assets, to maintain environmental compliance, ensure the health and safety of its workforce and optimise generation. A SCADA system provides real time monitoring and control of site asset performance and operating parameters, and provides incident management information to prioritise and allow rapid response to any unscheduled events. With the help of these facilities, Infinis closely tracks engine performance KPIs which form the basis for continued improvement efforts. All work activities are planned centrally and controlled using the IBM Maximo asset management system, with tasks dispatched to technical staff via a mobile application. Four comprehensive regional teams consisting of field service technicians manage day-to-day on-site tasks, supported by four national teams providing unscheduled breakdown cover, field overhauls, electrical, and controls and instrumentation (C&I) services.

Field operations are further supported by a purposefully designed workshop in Lancaster, which completely strips down and rebuilds its fleet of engines. This world-class engineering facility is fully equipped to enable work to be done safely and easily on each engine. It contains all the necessary modern measuring and calibration equipment to comprehensively check the condition of each component to ensure that each engine will provide safe and reliable operation for the next 40,000–60,000 hours of running.

4.3.3 Achievable NO_x Emission Concentrations

The *DECC Developing Best Available Techniques for combustion plants operating in the balancing market document (2016)*, indicates that spark ignition gas engines (such as the SG) can readily comply with the 190mg/Nm³ NO_x Emission Limit Value at 15% O₂ content with the use of lean burn or enhanced lean burn primary control measures.

Although stack emissions monitoring is yet to be undertaken on all of Infinis' Tranche B Specified Generator sites (pending installation of appropriate monitoring facilities), monitoring data available to Infinis from comparable engines combusting a range of fuels (provided as Appendix A) supports this position and confirms the plant's ability to comply with the NO_x ELV using the same technology under the management and maintenance regimes afforded by Infinis.

5.0 CONCLUSIONS

The conclusions from the assessments undertaken for the application is that the Hem Heath Electricity Generation Site is not predicted to significantly impact local receptors or the environment and will provide a high level of protection to the environment as a whole.

There are predicted to be no non-compliances with the air quality aspects of any environmental quality standards that can be attributed to the operation of the SG. Furthermore it is considered that due to the technology and fuel used, the SG can comply with the standard NO_x ELV and this is demonstrated by the extensive monitoring data presented in Appendix A.

Regent is fully committed to ensuring the highest standards are met and will undertake its activities in a manner consistent with best industrial practices and in accordance with the company's management system.

APPENDIX A

Compliance with NOx ELV Supporting Data

The following tables provide an overview of the emission monitoring data from both Infinis' extensive fleet of LFG engines (to MCERTS standards in Table A-2) and spot checks on generators fuelled with other gaseous fuels (Table A-1) over the past 12-months.

In reviewing this data it is important to note that the reference condition for LFG engines are @ 5% O₂ as opposed to the 15% O₂ required by the SGR and MCPD. Consequently the NO_x ELV of 190mg/Nm³ (at 273k, 101.3kPa and 15%O₂ (dry gas)) equates to 500mg/Nm³ (at 273k, 101.3kPa and 5%O₂ (dry gas)).

Table A-1
Hand-held spot measurements

Site	Engine	Manufacturer	Model	Rating (kWe)	Fuel	NO _x (mg/m ³)
Arlesey	4	Caterpillar	3516	1150	Propane	482
Arlesey	5	Caterpillar	3516	1150	Propane	434
Aveley	9	Jenbacher	320	1003	Natural Gas	496
Aveley	10	Jenbacher	320	1006	Natural Gas	499
Aveley	11	Jenbacher	320	1065	Natural Gas	492
Aveley	12	Jenbacher	320	1065	Natural Gas	492
Aveley N	2	Jenbacher	420	1413	Natural Gas	497
Aveley N	3	Jenbacher	320	1065	Natural Gas	432
Aveley N	4	Jenbacher	320	1065	Natural Gas	486
Aveley N	5	Jenbacher	320	1065	Natural Gas	500
Bevercoates	1	MWM	TBG 620	1358	Coal Mine Methane	495
Dogsthorpe	4	Caterpillar	3516	1150	Propane	466
Dogsthorpe	5	Caterpillar	3516	1150	Propane	485
Haydock	1	Caterpillar	170-20	2000	Natural Gas	355
Haydock	2	Caterpillar	170-20	2000	Natural Gas	365
Haydock	3	Caterpillar	170-20	2000	Natural Gas	395
Haydock	4	Caterpillar	170-20	2000	Natural Gas	500
Hem Heath	1	Caterpillar	3520	1950	Natural Gas	464
Hem Heath	2	Caterpillar	3520	1950	Natural Gas	490
Maltby	1	Jenbacher	420	1375	Coal Mine Methane	350
Maltby	2	Jenbacher	420	1451	Coal Mine Methane	438
Maltby	3	Jenbacher	420	1413	Coal Mine Methane	448
Maltby	4	Jenbacher	420	1451	Coal Mine Methane	461
Maltby	5	Jenbacher	420	1413	Coal Mine Methane	393

Site	Engine	Manufacturer	Model	Rating (kWe)	Fuel	NOx (mg/m3)
Maltby	8	Jenbacher	420	1451	Coal Mine Methane	479
Ongar	3	Caterpillar	3516	1000	Propane	353
Ongar	4	Caterpillar	3516	1000	Propane	466
Toray	1	MWM	TBG 620	1358	Coal Mine Methane	392
Trumps Farm	2	Caterpillar	3516	1150	Propane	497
Trumps Farm	3	Caterpillar	3516	1000	Propane	497
Wheldale	5	Jenbacher	420	1413	Natural Gas	479
Wheldale	6	Jenbacher	420	1413	Natural Gas	461

Table A-2
MCERTS Monitoring of LFG Engines

Site name	Engine number	Manufacturer	Model	kWe rating	Fuel Type	NOx Concentration (mg/Nm ³)
Aldeby	3	Caterpillar	3512	760	LFG	225
Allerton	1	Jenbacher	320	1065	LFG	500
Arlesey	3	Caterpillar	3516	1150	LFG	376
Arpley	7	Jenbacher	320	1006	LFG	493
Attlebridge	2	Jenbacher	320	1065	LFG	457
Aveley	6	Jenbacher	320	1006	LFG	415
Bletchley	4	Jenbacher	320	1065	LFG	349
Bletchley	5	Jenbacher	320	1065	LFG	448
Bletchley	7	Jenbacher	320	1065	LFG	325
Bletchley	8	Jenbacher	320	1048	LFG	479
Bletchley	11	Caterpillar	3516	1030	LFG	456
Bradgate	1	Jenbacher	320	1003	LFG	435
Brittons Hall Farm	4 (A2)	Jenbacher	320	1065	LFG	377
Brogborough	4	Jenbacher	420	1416	LFG	424
Brogborough	5	Jenbacher	320	1065	LFG	441
Brogborough	6	Jenbacher	420	1416	LFG	252
Brogborough	7	Jenbacher	420	1416	LFG	488
Brogborough	8	Jenbacher	420	1416	LFG	451
Brogborough	10	Jenbacher	320	1065	LFG	451

Site name	Engine number	Manufacturer	Model	kWe rating	Fuel Type	NOx Concentration (mg/Nm ³)
Brogborough	12	Jenbacher	320	1065	LFG	407
Brogborough	16	Jenbacher	320	1006	LFG	494
Bryn Pica	1	Jenbacher	320	1006	LFG	470
Burghfield	3	Caterpillar	3516	1150	LFG	265
Calvert	4	Jenbacher	620	2003	LFG	361
Calvert	10	Jenbacher	320	1065	LFG	399
Carnaby	1	Jenbacher	208	330	LFG	495
Chapel Farm	5	Jenbacher	320	1006	LFG	443
Chirk	1	Caterpillar	3516	1150	LFG	287
Chirk	2	Caterpillar	3516	1150	LFG	441
Compton Bassett	2	Jenbacher	320	1006	LFG	431
Compton Bassett	3	Jenbacher	320	1048	LFG	390
Costessey	3	Jenbacher	316	598	LFG	407
Danes moss	2	Caterpillar	3516	988	LFG	238
Darrington	1	Jenbacher	320	1048	LFG	335
Deep Moor	1	Jenbacher	320	1006	LFG	473
Dimmer	1	Jenbacher	320	1006	LFG	415
Dimmer	4	Jenbacher	320	1048	LFG	422
Drummond Moor	3	Jenbacher	208	330	LFG	455
Gallymoor	2	Jenbacher	320	1003	LFG	418
Glapwell	1	Jenbacher	316	625	LFG	435
Greengairs	1	Caterpillar	3516	1000	LFG	500
Greengairs	2	Caterpillar	3516	1000	LFG	491
Greengairs	4	Caterpillar	3516	1000	LFG	470
Hempstead	3	Jenbacher	320	922	LFG	384
Hill and Moor	1	Jenbacher	320	1048	LFG	483
Lamby Way	1	Jenbacher	320	1003	LFG	353
Leadenham	2	Jenbacher	208	330	LFG	472
Lillyhall	2	Jenbacher	208	330	LFG	464
Mayton Wood	2	Jenbacher	208	330	LFG	434
Middlemarsh	1	Jenbacher	208	330	LFG	483
Milton	2	Jenbacher	320	1065	LFG	157

Site name	Engine number	Manufacturer	Model	kWe rating	Fuel Type	NOx Concentration (mg/Nm ³)
Nanty Caws	2	Jenbacher	320	1003	LFG	317
Poplars	4	Caterpillar	3520	1950	LFG	442
Pwllfawatkin	3	Jenbacher	320	1065	LFG	463
Sandy Lane	1	Jenbacher	320	822	LFG	359
Staple Quarry	1	Jenbacher	208	330	LFG	458
Staple Quarry	2	Jenbacher	1003	1003	LFG	465
Stewartby	6	Caterpillar	3516	1150	LFG	484
Stewartby	7	Caterpillar	3516	1150	LFG	372
Taddington	1	Jenbacher	208	330	LFG	213
Tir John	1	Jenbacher	320	822	LFG	369
Walpole	2	Jenbacher	320	822	LFG	479
wapseys Wood	9	Jenbacher	320	1065	LFG	475
wapseys Wood	10	Jenbacher	320	1065	LFG	482
wapseys Wood	11	Jenbacher	320	1065	LFG	473
Welbeck	3	Caterpillar	3516	1150	LFG	306
Wingmoor	1	Jenbacher	320	922	LFG	498
Winterton	1	Caterpillar	3516	1000	LFG	445
Winterton	2	Caterpillar	3516	1000	LFG	388

EUROPEAN OFFICES

United Kingdom

AYLESBURY

T: +44 (0)1844 337380

BELFAST

T: +44 (0)28 9073 2493

BRADFORD-ON-AVON

T: +44 (0)1225 309400

BRISTOL

T: +44 (0)117 906 4280

CAMBRIDGE

T: + 44 (0)1223 813805

CARDIFF

T: +44 (0)29 2049 1010

CHELMSFORD

T: +44 (0)1245 392170

EDINBURGH

T: +44 (0)131 335 6830

EXETER

T: + 44 (0)1392 490152

GLASGOW

T: +44 (0)141 353 5037

GUILDFORD

T: +44 (0)1483 889800

LEEDS

T: +44 (0)113 258 0650

LONDON

T: +44 (0)203 805 6418

MAIDSTONE

T: +44 (0)1622 609242

MANCHESTER

T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE

T: +44 (0)191 261 1966

NOTTINGHAM

T: +44 (0)115 964 7280

SHEFFIELD

T: +44 (0)114 245 5153

SHREWSBURY

T: +44 (0)1743 23 9250

STAFFORD

T: +44 (0)1785 241755

STIRLING

T: +44 (0)1786 239900

WORCESTER

T: +44 (0)1905 751310

Ireland

DUBLIN

T: + 353 (0)1 296 4667

France

GRENOBLE

T: +33 (0)6 23 37 14 14