

Description	Grimsby B Reserve Site: Addendum to report reference PJ3979/16440/V1. <i>Environmental Noise Assessment to inform potential impacts of proposals</i>
Date	28 July 2022
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Issued to	RWE Generation UK plc
Ref No	PJ4147/16440

1. INTRODUCTION

The environmental noise assessment, to inform the potential impact of the proposals applicable to the existing planning permission was covered in report reference PJ3979/16440/V1: *Grimsby B Environmental Noise Assessment, to inform potential impacts of proposals (GBENA)*.

The original concept scheme for the Grimsby B development consisted of ten containerised gas-engines delivering 20MW electrical output, utilising existing electrical and gas infrastructure on site. The existing planning permission was renewed in January 2020.

The type of gas engine to be used for the Grimsby B development has now been re-evaluated and the gas engine scheme now proposed for installation will comprise four engines of 4.5MW capacity and one engine of 2.6MW, delivering 20.6MW electrical output.

The variation to the scheme will result in the following changes:

- Change to the type of Gas-Engine type, together with changes to engine enclosure design and position of external plant on and around the enclosure;
- Change to the B-site layout, consistent with a reduction in the number of gas engines and to accommodate the larger building enclosure design.

This addendum report provides a review of any potential change to the noise impact of the Grimsby B development, due to the above scheme changes.

2. PROPOSED B-SITE SCHEME

2.1 Site Layout

The revised site layout covering Grimsby A & B sites is shown in Figure 1.

The as-built 10 x gas engine units, comprising the A-site are shown located on the west half of the site, with the 5 x gas engine units comprising the B-site located on the eastern half of the site, as delineated by the red line boundary.

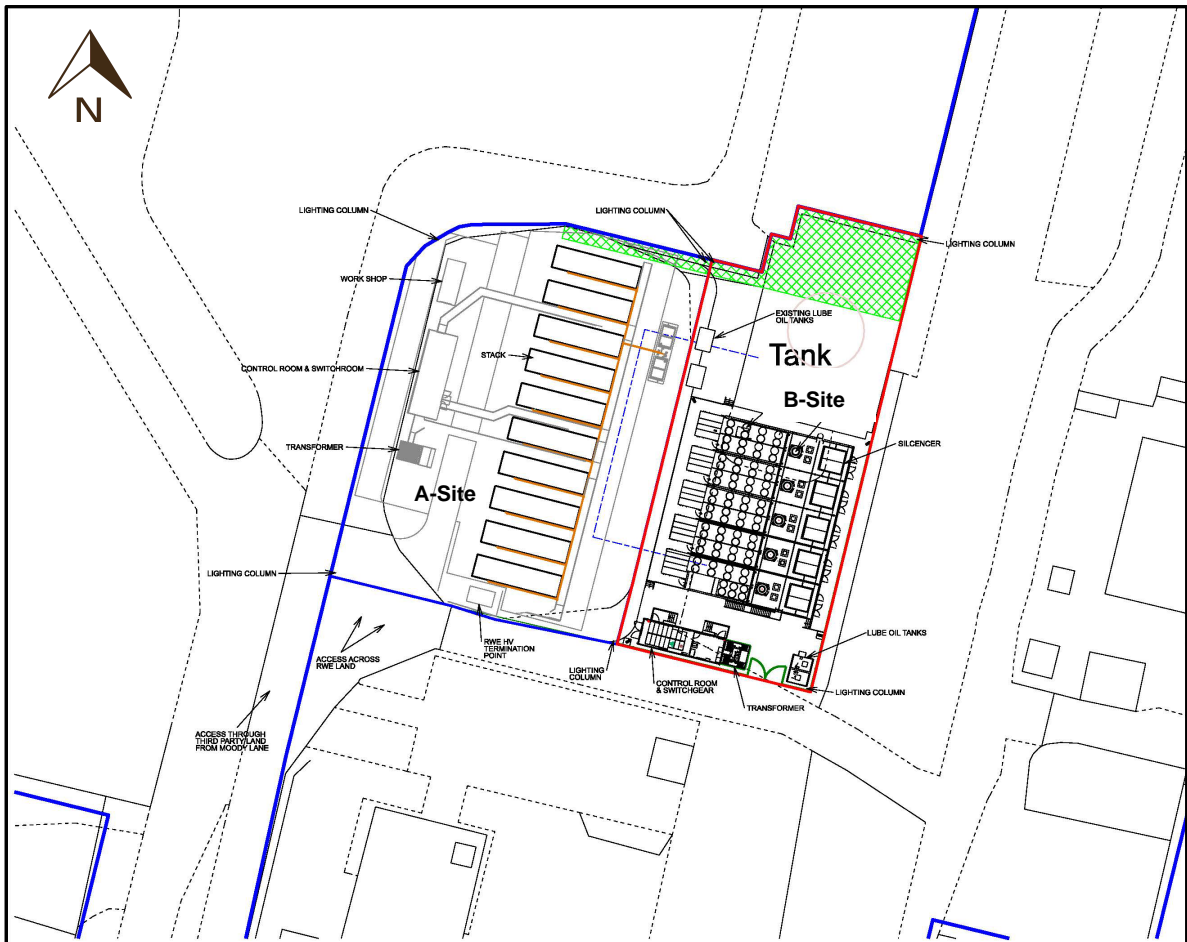


Figure 1: Plan of Grimsby A & B Sites showing as-built A-Site and proposed B-Site layout (red line boundary)

2.2 Gas engine detail

Detail of the Grimsby B site gas-engines, showing elevations and position of ventilation openings, exhaust stack and cooling heat exchangers is shown on the drawings included in Figure 2.

The drawings show the 5 x engine cells positioned side by side. The air-intake / ventilation opening to each building enclosure is shown as the louvred opening in the north-west elevation. The air-discharge opening is shown as the louvred openings across each side of the plenum located on the roof of the enclosure.

The exhaust stack extends from the back of the engine, through the roof of the enclosure, discharging 12.5m above the enclosure building.

The heat exchanger cooling fans are located on an open frame fixed to the top of the enclosure roof.

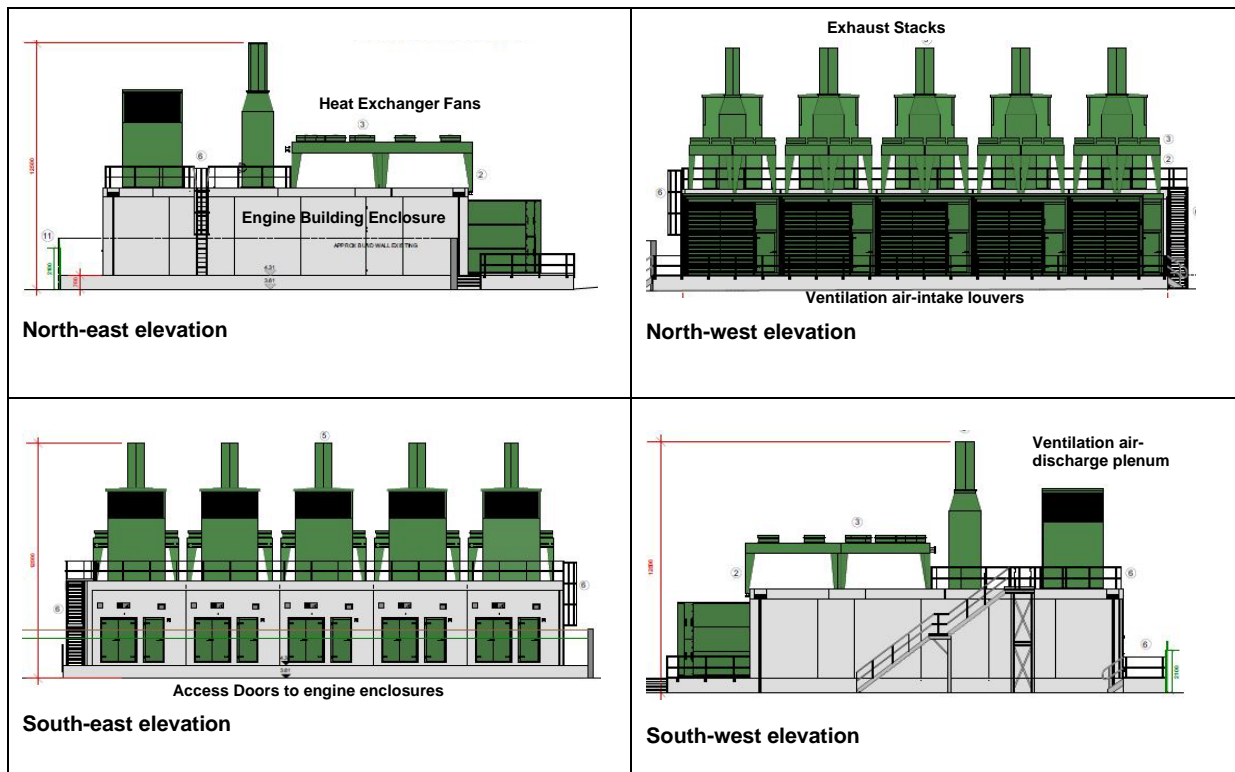


Figure 2: Detail of the Grimsby B site gas-engines, showing elevations and position of external plant items.

3. EVALUATION OF NOISE IMPACT CHANGE

3.1 Methodology

The GBENA (June 2020), provided an assessment of the potential impact of the Grimsby B development by predicting the specific operational sound level at the closest noise-sensitive receptor positions in the environment around the site. The predicted operational sound level was then compared to the measured background sound level at these receptor positions in accordance with the methodology detailed in BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*.

As input data to the computer noise model predictions, the sound power levels of the individual components of the gas engines were based on test data provided by the equipment suppliers and based on the concept scheme at that time. This data was consistent with meeting an average sound pressure level of 73dB(A) at 1m from each component of the gas engines, resulting in a level of <80dB(A) around the 1m surface of the overall package.

For the purpose of demonstrating any change in overall sound emission (or resulting impact) from operation of Grimsby B, due to the proposed gas engine scheme changes (as detailed in Sections 1 and 2), the sound emission from the components and equipment associated with the new scheme has been established, based on data provided by suppliers, together with calculations to establish the noise breakout from the engine building enclosure.

3.2 Sound power emission

3.2.1 ORIGINAL SCHEME

The sound power levels of the individual components of the original (or concept) Gas Engine scheme are reproduced from the GBENA in Table 1. The noted sound power levels are consistent with meeting an average sound pressure level of 73dB(A) at 1m from each component, taking account of the radiating surface area of each component.

Gas Engine Component	dB(A)	Octave band centre frequency (Hz)								
		31	63	125	250	500	1k	2k	4k	8k
Container casing	95	103	106	108	97	90	80	69	88	60
Air intake louver (with attenuator)	87	95	97	102	86	68	54	54	78	57
Air discharge louver (with attenuator)	88	100	105	102	83	66	57	57	80	64
Exhaust Stack (with attenuator)	85	77	77	80	77	79	76	80	79	66
Cooling radiator and fans (on roof)	85	75	82	86	85	77	77	78	79	70
Total (1 Gas-Engine Unit)	97	105	108	110	97	90	82	82	89	72
Total (10 Gas-Engine Units)	107	115	118	120	107	100	92	92	99	82

Table 1: Sound power level of main components of containerised Gas Engines (original scheme).

3.2.2 REVISED SCHEME

The sound power levels of the individual components of the revised Gas Engine scheme are included in Table 2. The noted sound power levels are consistent with meeting an average sound pressure level of 70dB(A) at 1m from each component, with this contract requirement subject to guarantee by the gas engine supplier.

It may be noted that the design specification requirement for all the individual items of plant to meet a 1m surface sound pressure level of 70dB(A) requires a high standard of acoustic design, utilising specialist and bespoke attenuation, silencing and acoustic treatment. This approach is consistent with the principle of applying Best Available Techniques (BAT) for the purpose of minimising sound emissions.

With respect to the sound emission produced by the elements of the gas-engine building enclosure, supplementary 'noise breakout' calculations have been completed, based on the sound reduction index of each building element. This calculation sheet is included in Appendix A of the report.

Plant / Equipment item	dB(A)	Sound power level dB, at octave band centre frequency (Hz)								
		31	63	125	250	500	1k	2k	4k	8k
Gas-engine Building Enclosure										
Long Side Wall each engine cell (NE)	78	84	85	87	84	73	69	64	56	51
Long Side Wall each engine cell (SW)	78	84	85	87	84	73	69	64	56	51
Short Side Wall each engine cell (NW)	73	78	79	81	78	68	63	58	51	45
Short Side Wall each engine cell (SE)	73	78	79	81	78	68	63	58	51	45
Roof (each engine cell)	78	85	86	88	85	72	68	62	55	50
SE Double Door (1 each cell)	71	92	94	81	71	62	61	57	51	55
SE Single Door (1 each cell)	69	89	91	78	69	59	59	55	49	52
NW Single Door (1 each cell)	69	89	91	78	69	59	59	55	49	52
Ventilation air-inlet louvers	82	-	103	93	76	73	72	66	64	65
Ventilation air discharge outlets (roof)	83	-	104	95	77	66	63	63	67	76
Gas-engine external plant										
Exhaust Stack (each unit)	82	112	103	94	81	75	69	62	54	53
Waste Heat Radiators (each unit)	91	-	95	91	92	88	86	83	81	76
Total (1 Gas Engine Unit)	93	112	109	100	94	89	87	83	81	79
Total (5 Gas Engine Units)	100	119	116	107	101	96	94	90	88	86

Table 2: Sound power level of main items of equipment and components included in the revised scheme.

Comparison of the total sound power emission from the original and revised gas engine schemes (tables 1 and 2) demonstrates that each gas engine unit associated with the revised scheme has an overall sound emission 4dB(A) lower than the original scheme.

This is due to the design of the revised scheme being based on individual components meeting a 1m surface sound pressure level of 70dB(A), rather than 73dB(A) for the original scheme. Improvement to the engine enclosure building, by increasing the sound insulation performance with a concrete blockwork construction, is also a contributing factor.

Moreover, by reducing the total number of gas engines to 5 units, from the original 10 units, this provides an additional reduction of 2dB(A), resulting in an overall reduction of 7dB(A), from 107dB(A) for the original scheme to 100dB(A) for the revised scheme.

4. CONCLUDING SUMMARY

This addendum report has included an assessment of the potential change to noise impact resulting from the proposed changes to the Grimsby B Gas Engine scheme, as detailed in Sections 1 and 2.

For the purpose of demonstrating any change in overall sound emission (or resulting impact) from operation of Grimsby B, due to the proposed new scheme, comparison has been made between the overall sound emission from the components and equipment associated with the original and new schemes, based on data provided by suppliers together with calculations to establish the noise breakout from the engine enclosures.

Comparison of the total sound power emission from the original and revised gas engine schemes (tables 1 and 2) has demonstrated that the revised scheme provides a total sound power emission 7dB(A) lower than the original scheme, due to improved design and a reduction in number of gas engine units.

The proposed new scheme would therefore provide a positive impact in comparison with the original scheme.

APPENDIX A

Noise Breakout Calculations
Relating to Engine Cell Building Enclosures



CLIENT: RWE
JOB NO: 16440
PROJECT: Grimsby B
ENCLOSURE DESCRIPTION: Clarke Energy Gas Engine Cells

Rev. No.	Date	Details
0 1a	Sep-14 30.10.14	Initial Includes grilles and vehicle access doors and revised layout

1. ENCLOSURE DIMENSIONS AND SOURCES

Long Sides NE and SW (m) = 18
Short Sides NW and SE per Engine Cell(m) = 5
HEIGHT (m) = 4

Short Sides (SE and NW) EACH (m²) = 20
Long Sides (NE and SW), EACH (m²) = 72
ROOF AREA / per Engine Cell (m²) = 90
TOTAL SURFACE AREA INCLUDING FLOOR (m²) = 364

DOORS AND GRILLS	Area(m ²) of each door or grille	Details
SE Double Door (1 each cell)	4.2	Acoustic Door AL-D/D52
SE Single Door (1 each cell)	2.3	Acoustic Door AL-D/D52
NW Single Door (1 each cell)	2.3	Acoustic Door AL-D/D52

SOURCE	LwA	Octaves Band Sound Power Level										No. off
		31	63	125	250	500	1k	2k	4k	8k		
Gas Engine	123	105	112	118	120	119	117	116	116	114	1	
TOTAL	123	105	112	118	120	119	117	116	116	114		

2. SOUND ABSORPTION AND NOISE LEVEL IN ENCLOSURE

Sound Absorption Coefficient	Octave Band								
	31	63	125	250	500	1k	2k	4k	8k
Enclosure Surface									
Walls	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.07	0.08
Ceiling	0.01	0.01	0.01	0.01	0.10	0.02	0.02	0.03	0.03
Floor including equipment	0.01	0.01	0.01	0.01	0.10	0.02	0.02	0.03	0.03
MEAN	0.02	0.02	0.02	0.02	0.06	0.03	0.03	0.05	0.06

Ignores the internal absorption of wall louvres

Sound Pressure Level (reverberant)	dB(A)	Octave Band								
		31	63	125	250	500	1k	2k	4k	8k
10Log(4/Rc)	-1	-1	-1	-3	-8	-4	-5	-7	-7	
T60 (Norris Eyring) (s)	10.4	10.4	10.4	7.8	2.4	6.2	5.2	3.1	2.8	
Lp rev	118	103	110	116	117	111	113	111	109	106

3. SOUND INSULATION AND TRANSMISSION OF NOISE

Sound Reduction Index, R	Octave Band								Source/Comment	
	31	63	125	250	500	1k	2k	4k		8k
Long Side Wall each engine cell (NE)	32	38	42	46	50	57	60	65	68	Concrete block 200mm 2500kg/m3
Long Side Wall each engine cell (SW)	32	38	42	46	50	57	60	65	68	Concrete block 200mm 2500kg/m3
Short Side Wall each engine cell (NW)	32	38	42	46	50	57	60	65	68	Concrete block 200mm 2500kg/m3
Short Side Wall each engine cell (SE)	32	38	42	46	50	57	60	65	68	Concrete block 250mm 2500kg/m3
Roof (each engine cell)	32	38	42	46	52	59	63	67	70	Concrete block 250mm 2500kg/m3
SE Double Door (1 each cell)	12	17	36	46	49	52	54	58	52	Acoustic Door
SE Single Door (1 each cell)	12	17	36	46	49	52	54	58	52	Acoustic Door
NW Single Door (1 each cell)	12	17	36	46	49	52	54	58	52	Acoustic Door

Breakout Lp at 1m free-field	dB(A)	Octave Band								
		31	63	125	250	500	1k	2k	4k	8k
Long Side Wall each engine cell (NE)	60	65	66	68	65	55	50	45	38	32
Long Side Wall each engine cell (SW)	60	65	66	68	65	55	50	45	38	32
Short Side Wall each engine cell (NW)	60	65	66	68	65	55	50	45	38	32
Short Side Wall each engine cell (SE)	60	65	66	68	65	55	50	45	38	32
Roof (each engine cell)	59	65	66	68	65	53	48	42	36	30
SE Double Door (1 each cell)	65	85	87	74	65	56	55	51	45	48
SE Single Door (1 each cell)	65	85	87	74	65	56	55	51	45	48
NW Single Door (1 each cell)	65	85	87	74	65	56	55	51	45	48

Breakout Lw	dB(A)	Octave Band								
		31	63	125	250	500	1k	2k	4k	8k
Long Side Wall each engine cell (NE)	78	84	85	87	84	73	69	64	56	51
Long Side Wall each engine cell (SW)	78	84	85	87	84	73	69	64	56	51
Short Side Wall each engine cell (NW)	73	78	79	81	78	68	63	58	51	45
Short Side Wall each engine cell (SE)	73	78	79	81	78	68	63	58	51	45
Roof (each engine cell)	78	85	86	88	85	72	68	62	55	50
SE Double Door (1 each cell)	71	92	94	81	71	62	61	57	51	55
SE Single Door (1 each cell)	69	89	91	78	69	59	59	55	49	52
NW Single Door (1 each cell)	69	89	91	78	69	59	59	55	49	52
Σ Lw Breakout	84	96	98	93	90	79	74	69	62	60
Σ Lw Inside	123	105	112	118	120	119	117	116	116	114
Enclosure Insertion Loss		9	14	25	30	40	42	46	53	54

Total for all doors and louvres. Adjust to per door or louvre before inputting into Predictor or use Lp at 1m in above table as Lw/m2.