



CBA Screening Report and CHP-R Assessment

Oswestry STOR Facility

FOR: ARL 020 LTD

PROJECT NUMBER: ECCS 129 002

PREPARED BY: EC CONSULTANCY SERVICES LTD

CBA Screening Report and CHP-R Assessment

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1 INTRODUCTION

1.1 OVERVIEW

This Combined Heat and Power Ready (CHP-R) Assessment supports an application submitted to the Environment Agency (EA) for an Environmental Permit to operate a gas-powered standby electricity generation plant (“the Facility”) at Land East of A5, Oswestry, Ball, Shropshire, SY11 2YU.

The proposed Facility will participate in National Grid’s Short-Term Operating Reserve (STOR) programme, providing electricity to the grid during peak demand periods. The combustion plant on site comprises 12 no. gas-powered reciprocating engines and generator units. The total net rated thermal input of the Facility is 70.98MWth with a total electrical output of 30.42MWe. The generators will run for a maximum of 2500 hours per annum during periods of high demand.

Operators of certain types of combustion installations are required to carry out an assessment of the opportunities for cogeneration (also known as combined heat and power) as part of the Environmental Permitting regime. The proposed Facility is subject to these requirements.

This report provides an assessment of the opportunities and technical considerations associated with operating the Facility as a high efficiency co-generation installation and has been prepared in accordance with the following key guidance:

- Environment Agency Guidance: Draft guidance on completing cost-benefit assessments for installations under Article 14 of the Energy Efficiency Directive, Version 0.9, April 2015;
- Environment Agency Guidance: Energy efficiency standards for industrial plants to get environmental permits, 15 July 2019;
- Department of Energy and Climate Change (DECC); Developing Best Available Techniques for combustion plants operating in the balancing market, final report, June 2016;
- Environment Agency Guidance: CHP Ready Guidance for Combustion and Energy from Waste Power Plants, Version 1.0, February 2013; and
- BREF: Reference Document on Best Available Techniques for Energy Efficiency February 2009.

1.2 SITE DESCRIPTION

The full address of the proposed Facility will be:

Land East of A5
Oswestry
Ball
Shropshire
SY11 2YU

The proposed Facility is to be located at National Grid Reference **SJ 30828 30275**.

Figure 1.2.1 below shows the location of the Facility.

Figure 1.2.1 Site Location



Image taken from Google maps © 2019
The site location is shown as a red star

The proposed Facility is located on land to the east of the A5, east of Oswestry. The site currently comprises greenfield land on the western boundary of a larger agricultural field.

The nearest residential properties to the Facility are located approximately 160m to the west of the Proposed Permit Boundary. The A5, with a strip of trees and open space on either side, lie between the Facility and these residential properties, which extend westwards away from the site towards Oswestry.

Several commercial properties lie approximately 600m to the north of the Facility on the other side of the A495. A small sewage treatment plant is located on land to the east. Land to the south, south-east and immediately north is used for agricultural purposes.

2 FACILITY OPERATIONS

2.1 COMBUSTION PLANT ON SITE

The proposed Facility will comprise 12 no. MTU 20V4000GS natural gas-powered reciprocating engines and generator units. The units are housed in individual containers within a secure compound, along with transformers, electrical switchgear and other associated infrastructure.

The proposed layout of the Facility can be seen in Figure 2.1.1 below.

Figure 2.1.1 Facility Site Layout

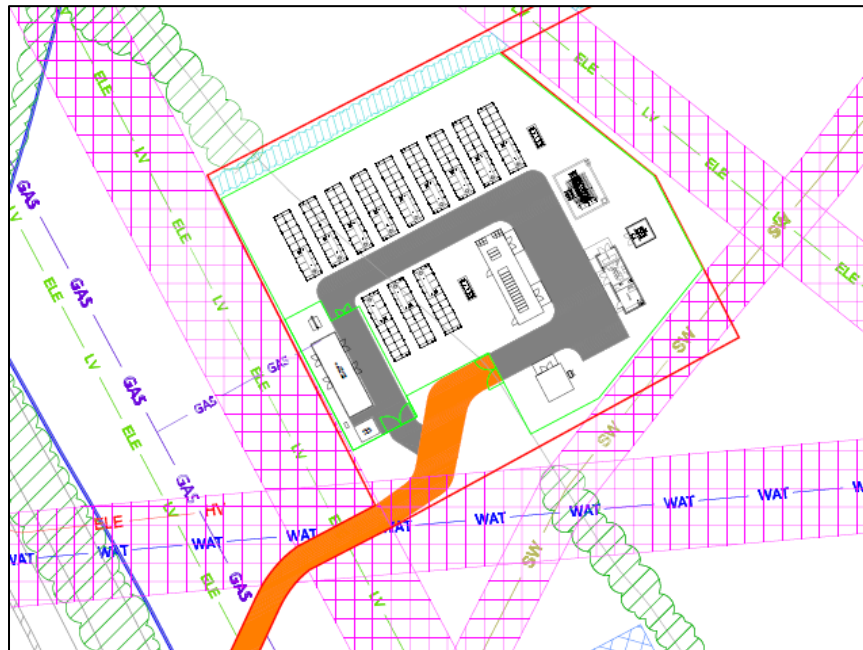


Image sourced from drawing no. 21331A-0201

Each engine will generate 2.535MWe at full load from a net rated thermal input of 5.915MWth. The total net rated thermal input of the proposed Facility is 70.98MWth with a total electrical output of 30.42MWe.

In practice, the electrical output of the plant will vary depending on the requirements of National Grid - some engines may stay dormant whilst others are producing electricity and engines can be run at variable loads if required to suit local demand. The generators will be required to operate for a maximum of 2500 hours per annum.

The plant has been designed specifically for the purpose of providing rapid response services to National Grid. It is considered that for smaller power plants such as that proposed, rows of smaller reciprocating engines are more efficient than gas turbines due to the variable generation demand on the plant and the necessity for fast response.

The use of individual gas engines is considered to be the most efficient solution (in terms of cost and performance) for peaking electricity supplies. Utilising smaller spark ignition engines, capable of fast start up and shut down, improves the overall efficiency of the plant as individual engines can be run at optimum loading (and therefore higher efficiency), whilst other engines are left dormant.

Electrical efficiency of the engines also remains high when run at variables loads, losing only 0.6% at 75% load and 2.3% at 50% load. Operating at maximum continuous rating (MCR, or full load), the plant will achieve a gross electrical efficiency (Lower Heating Value: LHV) of 42.9%. The total recoverable thermal output theoretically available from each engine is 2.54MWth, with a thermal efficiency of 42.8%. Therefore, if the full CHP potential of the plant was realised, the overall efficiency would be over 85%.

2.2 OPERATING REGIME AND MANAGEMENT

The Facility will be operated by **ARL 020 Ltd**, whose registered office is:

70 Jermyn Street
London
SW1Y 6NY

Company registration number is **11332783**.

Planning consent was initially granted for the proposed development by Shropshire Council in July 2019. Planning application reference: 18/04510/FUL.

The planning consent was varied in October 2019 to remove Condition 2 (approved plans) and Condition 7 (acoustic fence) and was granted (as varied) in December 2019. Planning application reference: 19/04640/VAR.

2.3 REGULATED ACTIVITIES

ARL 020 Ltd are applying for an Environmental Permit for the operation of a Section 1.1 Part A(1) activity listed under the Environmental Permitting (England and Wales) Regulations 2016 (as amended 2019).

Proposed Permitted Activities at the Facility are listed in Table 2.3.1 below.

Table 2.3.1 Regulated Activities

Regulated Activity	Description of Activity	Operational Capacity
Schedule 1 Part A Section 1.1 A (1)(a)	Burning of any fuel in an appliance with a net rated thermal input of 50 megawatts or more	70.98 MW Thermal Input 30.42 MW Electrical Output 2,500 Operational Hours per annum
Directly Associated Activities		
-	Oil Storage	From receipt of raw materials to dispatch for use
-	Surface Water Drainage	Handling and storage of site drainage until discharge to ground via the onsite soakaway

3 REGULATORY CONTEXT AND SCOPE OF ASSESSMENT

3.1 THE ENERGY EFFICIENCY DIRECTIVE

The Energy Efficiency Directive (2012/27/EU) aims to establish a common framework of measures for the promotion of energy efficiency within the EU. Chapter III considers efficiency in energy supply. Article 14 of Chapter III sets out policies for the promotion of efficiency in heating and cooling and requires member states to adopt policies which encourage consideration at local and regional levels of the potential of using efficient heating and cooling systems, in particular those using high efficiency co-generation.

Co-generation is the simultaneous generation in one process of thermal energy and electrical or mechanical energy, also known as Combined Heat and Power (CHP). High efficiency co-generation is that which achieves at least 10% savings in primary energy usage compared to the separate generation of heat and power.

Article 14 (5) states that:

'Member States shall ensure that a cost-benefit analysis in accordance with Part 2 Annex IX is carried out when, after 5 June 2014:

- (a) A new thermal electricity generation installation with a total thermal input exceeding 20MW is planned, in order to assess the cost and benefits of providing for the operation of the installation as a high-efficiency cogeneration installation.'*

3.2 ENVIRONMENTAL PERMITTING REGULATIONS

Schedule 24 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended 2019) (EPR) implements the relevant requirements of Article 14. Section 2 (1) states that:

'An application for the grant of an environmental permit under regulation 13 (1) for a relevant installation which generates electricity must contain a cost-benefit analysis which assess the costs and benefits of providing for the operation of the installation as a high efficiency co-generation installation.'

Relevant installations include those carrying out activities described in Part A (1) of Section 1.1 of Part 2 of Schedule 1 of EPR. As such, the Facility is subject to the provisions of Schedule 24.

Section 2 (4) of Schedule 24 sets out an exemption for this type of plant, stating:

'The requirement for a cost-benefit analysis in sub-paragraph (1) or (3) does not apply to peak load and back-up generating relevant installations for which the application for the grant or variation of an environmental permit states that operation under 1500 operating hours per year as a rolling average over a period of 5 years is planned.'

As the Operator is proposing operating hours of 2500 per annum as a rolling average over 5 years this exemption does not apply, and a cost benefit analysis is required under Schedule 24.

3.3 ENVIRONMENT AGENCY GUIDANCE

3.3.1 Accordance with Schedule 24

The principal guidance document for the application of Schedule 24 of EPR is Environment Agency Guidance: *Draft guidance on completing cost-benefit assessments for installations under Article 14 of the Energy Efficiency Directive, Version 0.9, April 2015.*

This document further describes when a CBA will be required for a relevant installation and when an Operator will be exempt. Figure 3.3.1 below is taken from Diagram 1: ‘CBA assessment methodology for new and refurbished thermal electricity generation installations’ of the guidance. This outlines the methodology to be used by applicants when undertaking assessments.

Figure 3.3.1 Diagram 1: CBA Assessment Methodology

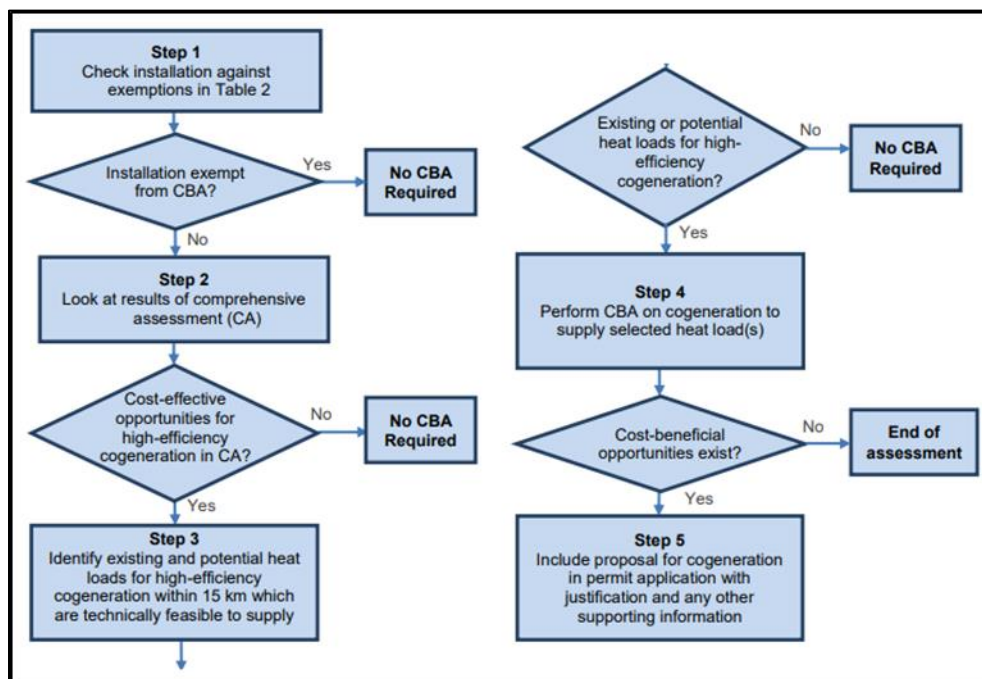


Image sourced from Environment Agency Guidance

As previously stated in Section 3.2, the exemption provided under Schedule 24 for peaking plants does not apply to the proposed Facility at Oswestry. Therefore, steps 2 and 3 are undertaken within Section 4 of this assessment.

3.3.2 Best Available Techniques (BAT) and CHP-Readiness (CHP-R)

In cases where there are no immediate opportunities for the supply of heat from the outset, the Environment Agency considers that to demonstrate BAT proposed combustion plants must be built to be CHP ready - to a degree dictated by the foreseeable future opportunities to supply heat.

The BAT Assessment should include:

- A basic description of the proposed plant;
- A description of the potential heat loads (including their appropriate selection) which have been used in the CHP-R Assessment; and

- A justification of the degree to which the new plant will be CHP-R based on the results of the CHP-R Assessment.

Environment Agency Guidance: *CHP Ready Guidance for Combustion and Energy from Waste Power Plants, Version 1.0, February 2013* is applicable to applicants / operators for new plants such that they can:

- Provide sufficient information to the Environment Agency in an application for an Environmental Permit to demonstrate BAT for a new plant which uses CHP at the outset or is designed to be CHP-R;
- In the case of a CHP-R plant, show that the new plant is designed to be ready, with minimum modification, to supply heat in the future;
- In the case of a CHP-R plant, make adequate technical provisions such that the new plant is ready, with minimum modification, to supply heat in the future; and
- Carry out periodic reviews of opportunities for the supply of heat.

The following information is required under Requirement 1: *Plant, Plant Location and Potential Heat Loads* of the CHP-R guidance:

- A description of the plant;
- A description of plant location;
- A description of the factors influencing the selection of the plant location;
- A description of the likely extent and nature of CHP opportunities (i.e. potential heat loads) in the area (an indicative search radius of 10 km should be used for plants less than 300 MW, and 15 km for plants greater than 300 MW);
- The appropriate selection of heat loads (which must be agreed with the Environment Agency at the Environmental Permit Pre-Application Stage, or (preferably) at the pre-planning application stage) to take forwards in the CHP-R Assessment;
- A justification for the appropriate selection of heat loads; and
- Identification of the expected supply and return requirements for the selected heat load / heat loads.

The demonstrations under Requirement 1 are addressed in this assessment and are summarised in the CHP-R Assessment Form included as Appendix A. CHP-Readiness at the proposed Facility is described in Section 4.4 below in the context of the heat loads identified and technology utilised.

4 ASSESSMENT

4.1 OVERVIEW OF PEAKING PLANTS AND THE USE OF CHP

Peaking plants are designed to respond quickly to calls from the grid and to operate for short periods of time (typically between 60-120 minutes). Although the Operator is proposing a limit of 2500 operating hours per annum, the plant may operate significantly less than this and frequently at a reduced electrical output. The limit of 2500 hours is to allow the proposed Facility to respond to an unforeseen increase in demand if required, whilst ensuring that there is no risk of breaching Environmental Permit conditions.

Peak periods of operation are anticipated to be between 07:00-10:00 and 16:00-19:00, with higher operating hours envisaged during the winter months than in the summer. However, during normal operations the Operator has no control over the operational hours of the plant, which are determined by the requirements of National Grid who will control the plant remotely.

The intermittent, unpredictable and variable nature of this generation makes utilising CHP for this type of activity potentially problematic, as a primary requirement of a viable and effective CHP scheme is that it can service the continuous heat demand of a particular user. The CHP-R Guidance recognises this, stating: *'whilst it is considered that CHP is technically feasible for all types of new plants, it is recognised that in some cases (such as peaking plant and anaerobic digestion plants) the provision of CHP would not be compatible with original operating regimes / intentions.'*

Heat demand profiles in the area, notably small industrial sites, commercial properties and residential areas, will require a steady supply of heat throughout the day (and many also at night) and would therefore need to significantly 'top-up' any heat received from the proposed Facility. Due to the difficulty in matching supply and demand profiles for heat, it will likely be difficult for ARL 020 Ltd to enter into a commercial contract with these users without the extensive use of thermal storage techniques.

The use of boiler systems to supply heat between operating hours would be very unlikely to result in any Primary Energy Savings (PES) during those times, and the slower response time for plant with auxiliary boiler systems is also somewhat problematic considering the original operating purpose of the plant. It would be exceedingly difficult to ensure a consistent supply of heat in switching from one source to another, particularly as the heat would only be available from the CHP plant for short bursts. In some cases, auxiliary systems would be required to shut down and start up again within a short period of time, and so lose efficiency.

With regards to the location of the plant, Section 4.1 of the CHP-R guidance states that *'to be commercially viable for CHP, new plants should ideally be sited close to potential heat loads / heat customers.... However, it is recognised that there are often other important factors which dictate a plant's location which may take precedence over immediate CHP opportunities.'* This is an important consideration for plants such as that proposed, as the location of these developments is primarily led by the availability of a suitable electricity grid and gas grid connection. This is recognised within Section 1.4 of Appendix A of the CHP-R guidance, and also within National Planning Policy. The proposed development also requires a location away from areas of flood risk, sensitive ecological receptors and landscape constraints, and where the impacts on local air quality are acceptable.

4.2 POTENTIAL HEAT USERS

4.2.1 Search Area and Sources of Information

The following section describes the extent and nature of CHP opportunities (i.e. potential heat users) in the vicinity of the proposed Facility. An indicative search radius of 10km has been used in accordance with the CHP-R guidance.

Potential heat users have been identified using the following sources of information:

- Shropshire Council online planning application register¹;
- The Association for Decentralised Energy District Heating Networks Map²; and
- Department for Business Energy and Industrial Strategy UK CHP Development Map³.

Once potential heat users were identified, two critical factors⁴ were considered to determine whether it would be technically feasible for the proposed Facility to supply them with heat. The two factors are:

1. The level of heat demand relative to supply (to ensure a suitable PES > 10%); and
2. The compatibility of the heat demand profiles with the heat supply (including through the use of thermal storage techniques to bridge incompatible loads); particularly relevant in this case due to the variable and intermittent nature of the Facility's generation, as described in Section 4.1.

4.2.2 Planning Application Search

A review of planning applications within the vicinity of the Facility has been undertaken to identify potential heat loads. Potential heat loads are those where planning consent and investment have been publicly announced but the heat load is not yet in existence.

It is considered that a search of all applications within a 10km of the proposed Facility would be unfeasible as it is not possible to screen applications based on size or development type. As such, the wide search area inevitably yields an unmanageable number of results. Also, given that the 10km radius is suggested for plants up to 300MWth, it would appear disproportionate to consider such a wide area for a plant of circa 71MWth.

As an alternative, the guidance within Annex IX Part 2 of the Energy Efficiency Directive has been followed, suggesting potential heat loads be identified '*taking account of rational possibilities (for example technical feasibility and distance).*' On this basis, all planning applications within 2km of the proposed Facility submitted to Shropshire Council within the last two years have been reviewed.

The search area can be seen in Figure 4.2.2 below.

¹ <https://pa.shropshire.gov.uk/online-applications/>

² <https://www.theade.co.uk/resources/guidance/district-heating-installation-map>

³ <https://chptools.decc.gov.uk/developmentmap>

⁴ Taken from page 8 of Environment Agency's CHP-R Guidance

Figure 4.2.2 Planning Application Search Area



Image sourced from Grid Reference Finder
The location of the Facility is shown as a red star
The blue circle denotes a 2km radius search area

The search identified seven relevant applications:

- Residential development of up to 150 no. dwellings on land to the south of Middleton Road, Oswestry. Planning application reference: 17/06025/OUT; currently under consideration;
- Outline application for the erection of industrial units (B1, B2 and B8 uses) on land to the north of Whittington Road, Park Hall, Shropshire. Planning application reference: 18/05391/OUT; currently under consideration;
- Section 73 application for the installation of ground source heat pumps and a biomass boiler to serve commercial premises in Artillery Business Park, Garrison Avenue, Park Hall, Oswestry (adjacent to 18/05391/OUT). Planning application reference: 19/03877/FUL; granted permission in October 2019;
- Outline application for residential development on land south-east of Whittington Primary School, Station Road, Shropshire. Planning application reference: 18/03354/OUT; currently awaiting decision;
- Erection of 34 no. residential dwellings, open space and a community parking area on land south-east of Whittington Primary School, Station Road, Whittington, Shropshire. Planning application reference: 18/01990/FUL; granted permission in June 2019;
- Residential development of 52 no. dwellings on land to the north of Whittington Road, Oswestry, Shropshire. Planning application reference: 19/02685/EIA; currently under consideration; and

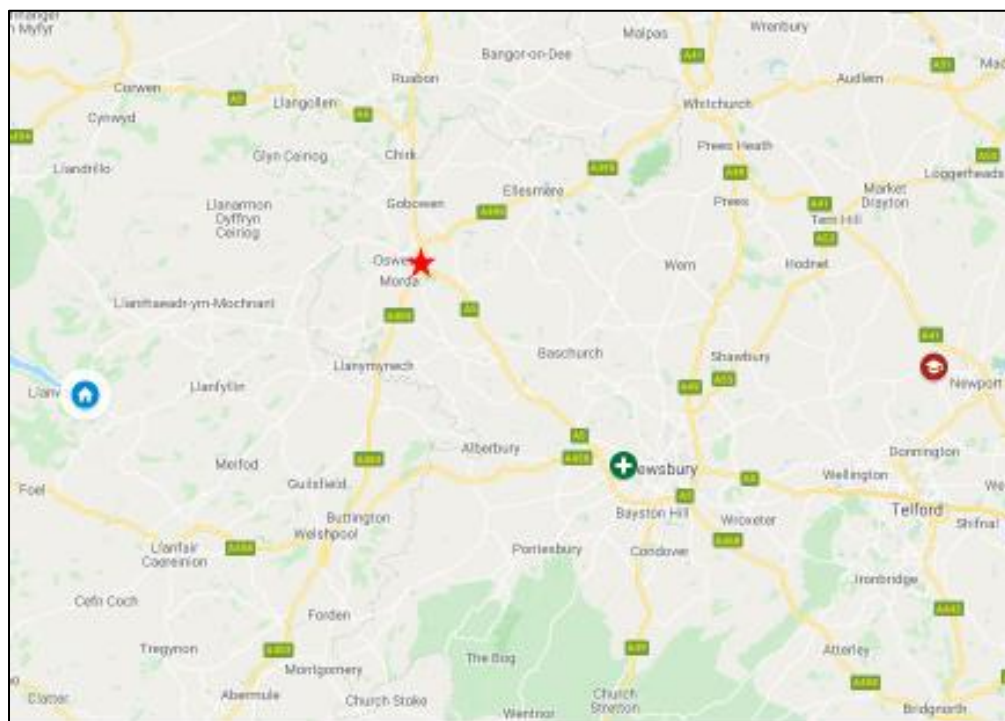
- Residential development of 48 no. dwellings on land to the north of Whittington Road, Oswestry, Shropshire. Planning application reference: 19/02686/EIA; currently under consideration.

These applications have been considered further within Table 4.2.4b below.

4.2.3 District Heating Networks

The Association for Decentralised Energy's (ADE) District Heating Installation Map shows university, hospital and residential/commercial district heating installations across the U.K. Their interactive map has been used to identify current and planned district heating networks within 10km of the Facility, shown in Figure 4.2.3 below.

Figure 4.2.3 District Heating Networks within the Vicinity of the Facility



Sourced from Association for Decentralised Energy's (ADE)
District Heating Installation Map
The location of the Facility is shown as a red star

There are no current or planned district heating networks within 10km of the proposed Facility. The nearest three operational district heating networks to the proposed Facility are as follows:

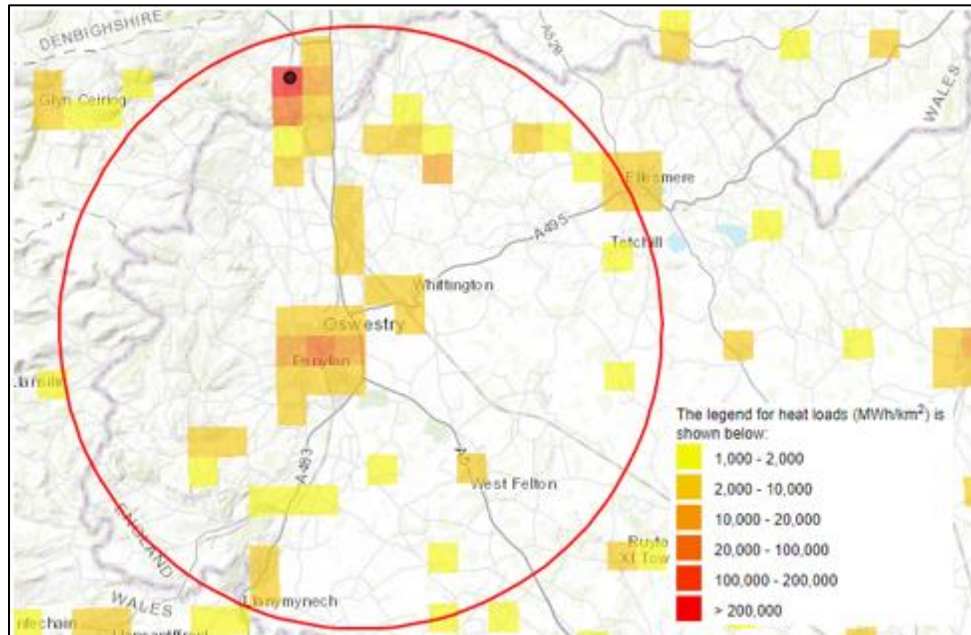
- Llanwddyn Community Heating Scheme; located at SY10 0LR – 30km to the south-west;
- Royal Shrewsbury Hospital; located at SY3 8XQ – 33km to the south-east; and
- Harper Adams University College; located at TF10 8NB – 41km to the south-east.

Given the distance of these district heating networks from the proposed Facility it is not considered necessary to further assess supplying these networks at this time.

4.2.4 BEIS UK CHP Development Map

The Department for Business, Energy and Industrial Strategy's (BEIS) UK CHP Development Map is designed to geographically represent theoretical heat demand across various sectors within the United Kingdom. Figure 4.2.4a below illustrates the total theoretical heat demand within 10km of the proposed Facility expressed as MWh/km².

Figure 4.2.4a Mapped Theoretical Heat Demand within 10km of Facility



Sourced from BEIS UK CHP Development Map
The red circle denotes a 10km search radius

One Large Heat Load Site was identified within 10km of the Facility, shown on the figure above as a black circle. This appears from online mapping to be Kronospan Chirk - a wood product manufacturer located at Maesgwyn Farm, Wrexham, LL14 5NT. This site is considered further in Table 4.2.6 below.

No District Heating Networks were identified within the 10km search area.

A breakdown of heat demand by sector within the 10km search area is presented in Table 4.2.2b below.

Table 4.2.4b Theoretical Heat Demand by Sector within 10km of Facility

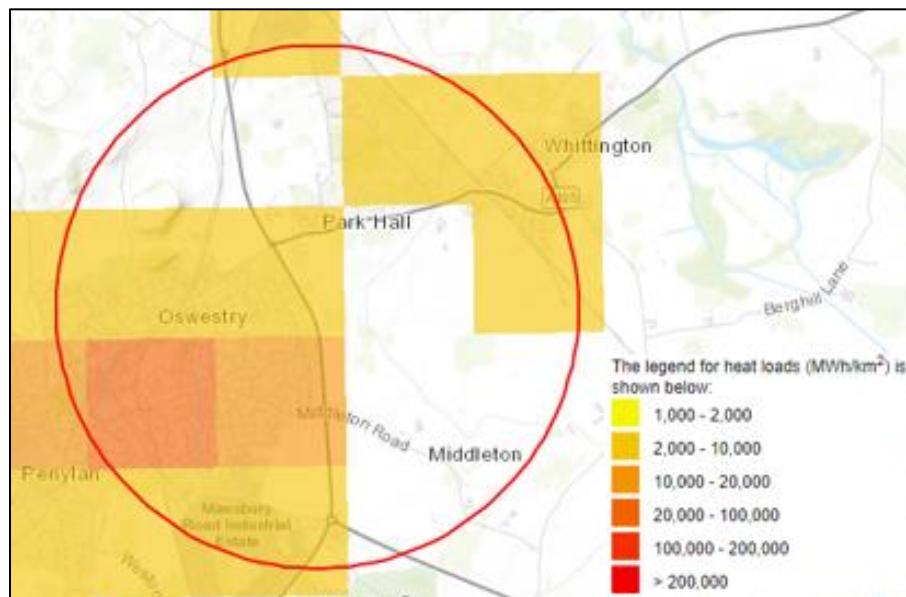
Sector	Share of Total Load Identified (%)	Estimated Average Demand Identified (MWh)
Communications and Transport	0.02	102
Commercial Offices	0.35	2,070
Domestic	48.19	283,179
Education	0.82	4,835
Government Buildings	0.08	468
Hotels	0.16	943
Large Industrial	46.46	273,031

Sector	Share of Total Load Identified (%)	Estimated Average Demand Identified (MWh)
Health	0.52	3,062
Other	0.17	1,024
Small Industrial	2.55	14,997
Prisons	0	0
Retail	0.49	2,870
Sport and Leisure	0.15	898
Warehouses	0.03	188
District Heating	0	0

At this scale, the information obtained from the UK CHP Development Map is considered to have relatively limited utility for the Operator to identify potential heat loads. The large search area inevitably yields vast theoretical demand but does not provide a basis to identify technically or economically viable opportunities to supply heat, particularly considering the lack of current or planned district heating networks in the area and the limited amount of heat theoretically available from the proposed Facility.

A revised search area of 2km is presented in Figure 4.2.4c below.

Figure 4.2.4c Mapped Theoretical Heat Demand within 2km of Facility



Sourced from BEIS UK CHP Development Map
 The red circle denotes a 2km search radius

A breakdown of heat demand by sector within the 2km search area is presented in Table 4.2.4d below.

Table 4.2.4d Theoretical Heat Demand by Sector within 2km of Facility

Sector	Share of Total Load Identified (%)	Estimated Average Demand Identified (MWh)
Communications and Transport	0.05	46
Commercial Offices	0.82	796
Domestic	88.53	86,015
Education	1.28	1,246
Government Buildings	0.32	311
Hotels	0.32	314
Large Industrial	0	0
Health	1.8	1,753
Other	0.31	303
Small Industrial	4.55	4,419
Prisons	0	0
Retail	1.6	1,556
Sport and Leisure	0.3	294
Warehouses	0.11	106
District Heating	0	0

The heat demand identified is predominantly from the Domestic sector. There is also significant demand from the Small Industrial, Health, Retail, Education, Commercial Office, Hotels and Retail and Sports and Leisure sectors.

The use of online mapping has sought to identify the sources of the demand presented in Table 4.2.4d above. Specific sources of theoretical heat demand are presented in Table 4.2.4e below, along with the potential heat demand identified within the planning application search in Section 4.2.2.

The potential to supply these heat loads with waste heat recovered from the facility is also discussed in Table 4.2.4e below.

Table 4.2.4e Assessment of Individual Potential Heat Loads by Sector

Heat Load	Distance and Direction (m)	Estimated Heat Demand (MWh)	Notes	Potential?
Domestic (Residential)				
Existing properties west of the A5 between Shrewsbury	135 W		It is highly unlikely that the Facility could access low heat-density residential demand	

Heat Load	Distance and Direction (m)	Estimated Heat Demand (MWh)	Notes	Potential?
Road and Whittington Road		86,015	in the absence of any current or planned district heating networks.	No
Planning application ref: 17/06025/OUT Residential development	875 S		Heat would be required by users during the day and for longer periods during weekends. Incompatible demand/supply profiles and difficulty in achieving a suitable PES using auxiliary boiler systems.	
Planning applications ref: 18/03354/OUT and 18/01990/FUL	1,970 E		Further assessment of supplying Residential sector heat demand is not considered necessary at this time.	
Planning applications ref: 19/02685/EIA and 19/02686/EIA	775 NW			
Small Industrial				
Planning application ref: 18/05391/OUT Erection of buildings for B1, B2 and B8 uses	615 NW	4,419	A Section 73 planning application was approved in October 2019 for the installation of ground source heat pumps and a biomass boiler to serve commercial premises within Artillery Business Park. On this basis, Further assessment of supplying heat demand from this location is not considered necessary at this time.	No
Existing properties within Artillery Business Park (north of the A495)				
Properties within Maesbury Road Industrial Estate	1,650 SSW		Whilst it would require circa. 2km of pipework across the A5 and multiple landholdings to export heat to Maesbury Road Industrial Estate, it is considered technically feasible at this stage. Further assessment of the potential to supply specific users in this location has been undertaken in Table 4.2.4f below.	Yes
Health				
Robert Jones and Agnes Hunt Orthopaedic Hospital	2,000 N	1,753	It would require circa. 2.5km of pipework through multiple landholdings to export heat to this user; pipework would be required to cross at least one main road. Steady supply of heat likely to be required by hospital for space heating, throughout the day and potentially at night. Incompatible demand/supply profiles and difficulty in achieving a suitable PES using auxiliary boiler systems.	No

Heat Load	Distance and Direction (m)	Estimated Heat Demand (MWh)	Notes	Potential?
			Further assessment of supplying Health sector heat demand is not considered necessary at this time.	
Education				
The Meadows Primary School, Harlech Road	400 W	1,246	<p>Pipework required to cross the A5, woodland and residential areas to access these heat loads.</p> <p>Limited individual demand relative to supply, and steady heat supply throughout the day likely required by schools for space heating.</p> <p>Incompatible demand/supply profiles and difficulty in achieving a suitable PES using auxiliary boiler systems.</p> <p>Further assessment of supplying Education sector heat demand is not considered necessary at this time.</p>	No
North Shropshire College	1,330 SW			
Holy Trinity C of E Primary Academy	1,160 SW			
Retail (R) and Commercial Offices (CO)				
Properties within Maesbury Road Industrial Estate	1,650 SSW	1,556 (R) + 796 (CO)	<p>Whilst it would require circa. 2km of pipework across the A5 and multiple landholdings to export heat to Maesbury Road Industrial Estate, it is considered technically feasible at this stage.</p> <p>Further assessment of the potential to supply specific users in this location has been undertaken in Table 4.2.4f below.</p> <p>It is not considered technically viable to access properties within central Oswestry due to the impracticalities in installing pipework through 1.2km of medium density residential areas.</p> <p>Significant distance from the Facility relative to theoretical heat demand is unlikely to result in economically viable opportunities for supply</p> <p>There appear to be several properties in this location which may have scope to utilise waste heat for space heating. It is considered technically feasible at this stage.</p>	Yes
Properties in central Oswestry	1,750 W			No
Properties between Whittington roundabout and Gobowen Road	1,010 W			Yes

Heat Load	Distance and Direction (m)	Estimated Heat Demand (MWh)	Notes	Potential?
			Further assessment of the potential to supply specific users in this location has been undertaken in Table 4.2.4f below.	
Sports and Leisure and Hotels				
Oswestry Leisure Centre	1,460 SSW	294	Given the distance of this theoretical demand from the Facility relative to its size it is highly unlikely that a suitable PES could be achieved. Incompatible demand/supply profiles as heat demand is likely to be required throughout the day, in the evening and at night.	No
Travelodge and Premier Inn – Oswestry	1,670 S		Difficultly achieving a suitable PES using auxiliary boiler systems. Further assessment of supplying the Sports and Leisure and Hotels sectors heat demand is not considered necessary at this time.	
Large Heat Load Sites				
Kronospan Chirk (wood product manufacturer)	8500 N	115,116	It would require circa. 9.5km of pipework across several main roads, multiple landholdings, areas of flood risk and ecologically sensitive sites to export heat to this site. Given the size of this heat demand relative to the level of supply available to recover from the Facility it is highly unlikely a suitable PES could be achieved. Further assessment of the potential to supply heat demand from this site is not considered necessary at this time.	No

Further assessment of the potential heat loads carried forward is undertaken in Table 4.2.4f below.

Google maps has been used to establish further details of specific potential heat users, in order to better understand the nature and extent of their demand to determine whether or not it is likely to be compatible with heat theoretically available to recover from the Facility.

Table 4.2.4f Further Assessment of Specific Potential Heat Loads

Heat Load	Distance and Direction (m)	Estimated Heat Demand (MWh)	Notes	Potential?
Properties within Maesbury Road Industrial Estate				
Screwfix (DIY and hardware store)	1,830 S	-	Heat likely required during the day for space heating.	Yes
Oswestry Cattle (auction house)	1,700 SSW	-	Heat likely required during the day for space heating.	Yes
Properties between Whittington roundabout and Gobowen Road				
Furrows Ford Oswestry (car dealership)	680 NW	-	Heat likely required during the day for space heating.	Yes
Traditional Products (woodworking manufacturer and supply shop)	820 NW	-	Heat likely required during the day for space heating and potentially during evening / night-time periods. Potential for heat demand associated with manufacturing processes.	Yes
Masons Timber Products (timber merchant)	834 WNW	-	Heat likely required during the day for space heating and potentially during evening/ night-time periods. Potential for heat demand associated with manufacturing processes.	Yes

All of the potential heat loads presented in Table 4.2.4f above were sent a letter inviting expressions of interest from those that may have scope to utilise heat recovered from the Facility (a letter template is included as Appendix B).

To undertake further assessment of the potential to supply these heat loads the following information was requested:

- Peak heat demand (MWth);
- Average heat demand (MWth);
- Annual quantity of heat demand (MWh);
- Typical heat demand profile; and
- Details of any heating infrastructure already located at your site.

None of the sites identified In Table 4.2.4f above responded the to the written request for information.

4.2.5 Summary of Assessment

There are no current or planned district heating networks within 10km of the proposed Facility. In the absence of an operational network it is highly unlikely that it would be technically or economically feasible

to supply low heat density residential heat loads. Supplying these heat sources is also problematic, due to the difficulties in matching demand and supply profiles for heat.

The use of boiler systems to supply heat between operating hours would be very unlikely to result in any Primary Energy Savings (PES) during those times and the slower response time for plant with auxiliary boiler systems is also problematic, considering the operating purpose of the plant. It would be exceedingly difficult to ensure a consistent supply of heat to service heat loads when switching from one source to another, particularly as the heat would only be available from the CHP plant for short bursts.

It is not considered technically viable to supply much of the identified heat demand from the Education, Commercial Office, Health, Hotels, Leisure and Retail sectors due to the distance between the Facility and these users. Furthermore, incompatible demand/supply profiles are problematic as heat demand is likely to be required throughout the day and potentially at night.

Where sites in the Small Industrial and Retail sectors were identified as have potentially significant heat demand, they were contacted as part of this assessment. A letter inviting expressions of interest was sent to all sites identified and no responses were received.

It is noted that as part of the assessment three important considerations in terms of technical feasibility have not been considered, which would further reduce the viability of serving these heat loads, including:

- Specific challenges associated with natural and man-made barrier between the Facility and potential heat loads (roads, watercourses, sensitive sites, multiple land ownerships and electricity and gas infrastructure);
- Details of the exact nature of theoretical demand (pressure, temperature, etc) and accurate demand profiles. Also, no consideration has been given to existing sources of heat provision within these sites; and
- All distances between the Facility and potential heat loads were measured as a straight line from the boundary of the Facility. In reality, distances would be significantly greater as deliverable pipework routes were determined.

4.3 COST BENEFIT ANALYSIS

Based on the evidence above, it is not considered necessary or appropriate to utilise the Electricity Generation Installation as a high efficiency co-generation installation at this time.

This is based on the lack of suitable off-takers for waste heat that would be technically or economically feasible for the Facility to supply, coupled with the original operating intention and regime.

Therefore, and in accordance with Article 14 (5), a cost benefit analysis is not considered necessary for the proposed development.

4.4 CHP READINESS

The CHP-R guidance states *'where there are no immediate CHP opportunities, BAT is to build the power or EfW plant to be CHP-R to a degree which is dictated by the likely future opportunities which are technically viable and which may, in time, become economically viable. As such, in these cases, determining CHP-R requires consideration to be given to the likely extent and nature of future opportunities in the chosen location'*.

The extent and nature of theoretical heat demand in the vicinity of the Facility has been identified within this assessment.

The CHP-R Guidance goes on to state that *'the assessment should demonstrate that the new plant is designed to be ready, with minimum modification, to supply heat in the future without significant modification of the original plant/equipment. For example, a CHP-R plant will not be required to replace major items of original plant/ equipment but should retain the capability for additional plant/equipment to be installed at a later date.'*

All of the engines at the Facility are supplied as CHP ready units. Providing a heat recovery option would involve the installation of containerised heat recovery units adjacent to each generating unit. This would require some modification to the existing configuration on site, but is technically possible - subject to any regulatory, planning and environmental permitting requirements at that time. Space will be left for the installation of pipework necessary to export the heated water from the recovery units off site.

The installation of a heat recovery option on the proposed plant in the future would not materially impact on the electrical generation potential/capacity of the plant. However, it could influence the plants start up and shut down times – compromising the original operating intention of providing STOR services to National Grid.

It is considered that given the intended operating regime and the lack of suitable and/or compatible heat demand, this degree of CHP readiness is appropriate at this time, taking particular account of the lack of current or planned district heating networks in the vicinity of the site.

5 SUMMARY AND CONCLUSIONS

5.1 CONCLUSIONS

ARL 020 Ltd are proposing to develop a 30.42MWe gas-powered standby generation facility on Land East of A5, Oswestry , Ball , Shropshire , SY11 2YU. The Operator will be required to hold an Environmental Permit under Schedule 1 of the Environmental Permitting (England and Wales) Regulations (as amended) 2019.

The Facility will participate in the National Grid's Short-Term Operating Reserve (STOR) scheme, providing electricity to the grid in peak demand periods. It is anticipated that the Facility will be required to operate for a maximum of 2,500 hours per annum, as required by the requirements of National Grid who control the plant remotely.

The intermittent, unpredictable and variable nature of this generation makes utilising CHP for this type of activity problematic, as a primary requirement of viable and effective CHP is that it can service the heat demand of a particular user. The CHP-R Guidance recognises this fact and *states 'whilst it is considered that CHP is technically feasible for all types of new plants, it is recognised that in some cases (such as peaking plant and anaerobic digestion plants) the provision of CHP would not be compatible with original operating regimes / intentions.'*

No District Heating networks or suitable heat off takers were identified in this assessment. Therefore, and in accordance with Article 14 (5), a cost benefit analysis is not required for the proposed development.

The engines are supplied as CHP ready units and it is technically possible to recover heat in the future should a commercially viable source for the supply of heat be identified. Providing a heat recovery option would involve the installation of containerised heat recovery units and pipework; this would not materially impact on the electrical generation potential/capacity of the plant.

The installation of this equipment is subject to any planning and permitting requirements at that time. It is considered that this degree of CHP readiness is an appropriate solution at this time. ARL 020 Ltd will carry out a periodic review of opportunities to utilise the waste heat from the development once an Environmental Permit is in place.

APPENDICES

APPENDIX A – CHP-R ASSESSMENT FORM: REQUIREMENT 1

#	Description	Units	Comments
Requirement 1: Plant, Plant Location and Potential Heat Loads			
1.1	Plant Name	-	ARL 020 Ltd STOR Facility
1.2	Plant Description	-	Standby electricity generation facility for provision of peaking electricity supplies Comprises 12 no. 2.5MWe MTU 20V4000GS containerized natural gas-powered reciprocating engines and generator units Electrical switchgear, transformers and associated infrastructure
1.3	Plant Location (postcode/grid ref)	-	Land East of A5, Oswestry, Ball , Shropshire, SY11 2YU. National Grid Reference - SJ 30828 30275.
1.4	Factors Influencing Selection of Plant Location	-	Proximity to economically and technically viable electricity and gas grid connections. Located away from sensitive receptors, including: Areas of flood risk; ecological designations; air quality management areas; heritage and landscape constraints and conflicting planning policy designations.
1.5	Operation of Plant		
a)	Proposed Operational Plant Load (during normal operations)	%	100
b)	Thermal Input at Proposed Operational Plant Load	MWth	70.98
c)	Net Electrical Output at Proposed Operational Plant Load	MWe	30.42
d)	Net Electrical Efficiency at Proposed Operational Plant Load	%	42.8
e)	Maximum Plant Load	%	100
f)	Thermal Input at Maximum Plant Load	MWth	70.98
g)	Net Electrical Output at maximum Plant Load	MWe	30.42
h)	Net Electrical Efficiency at Maximum Plant Load	%	42.8

#	Description	Units	Comments
i)	Minimum Stable Plant Load	%	50
j)	Thermal Input at Minimum Stable Plant Load	MWth	37.51
k)	Net Electrical Output at Minimum Stable Plant Load	MWe	15.26
l)	Net Electrical Efficiency at Minimum Stable Plant Load	%	40.6
1.6	Identified Heat Loads		
		-	<p>A review of the following sources was undertaken to identify Potential Heat Loads:</p> <ul style="list-style-type: none"> • ADE's District Heating Network Map • BEIS's UK CHP Development Map • Shropshire Council's online planning application search <p>No identified heat loads were considered appropriate for further assessment at this time.</p>

APPENDIX B – LETTER TEMPLATE TO POTENTIAL HEAT USERS

xxrd December 2019
Ref: ECCS 129 002 L 002

xxx
xxx
xxx
SY11 xxx

Sent by email: xxxxxxxxxxxxxx

Dear Sir/Madam,

Potential for heat supply from standby energy facility

xxxxx in Oswestry has been identified as having the potential to connect to a new heat supply from a proposed energy generation facility in the proximity of Whittington Road, Oswestry.

The proposed facility is being developed for the purposes of standby energy generation and will respond to calls from the National Grid to supply electricity during peak demand periods. The operating hours of the facility are anticipated to be between 7:00-10:00 and 16:00-17:00.

The developer is exploring options to recover the heat from this process for export to off-site users and welcomes expressions of interest from sites that feel they may have scope to utilise this heat.

If you wish to discuss this opportunity further, we would be grateful if you could include the following information with your expression of interest:

- Peak heat demand (MWth);
- Average heat demand (MWth);
- Annual quantity of heat demand (MWh);
- Typical heat demand profile; and
- Details of any existing heating infrastructure located at your site.

Whilst we are seeking sites that would be willing and able to enter into supply contracts with our developer, responding to this request will not constitute any form of commercial agreement. There is no legal obligation for you to respond to this letter, or to supply any information to us.

EC Consultancy Services Ltd are acting as an agent on behalf of the developer and are the point of contact regarding all matters relating to the proposed facility at this time. The deadline for expressions of interest is Friday 31st January 2020. If you would like to discuss this opportunity further, please respond via email or contact me at the number below.

Yours Sincerely,

Lucinda Hall
Director

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