Caulmert Limited

Engineering, Environmental & Planning Consultancy Services

Deeside Power Station

Deeside Power (UK) Limited

Deeside Power Station Variation Application

Combined Heat and Power Ready Assessment

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Combined Heat and Power Ready Assessment

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1.0 INTRODUCTION

1.1 Background

1.1.1 Caulmert Limited was appointed by Deeside Power (UK) Limited (hereafter referred to as "the Operator") to prepare a bespoke variation application for submission to Natural Resources Wales (NRW) for the existing environmental permit (reference EPR/XP3131VK/V003). The variation is required to permit the installation and operation of a second 49.9 MW peaking plant at Deeside Power Station (hereafter referred to as "the Site"), comprising 11 natural gas-fuelled reciprocating engines.

1.1.2 The Site is located at Weighbridge Road, Deeside Industrial Park, Deeside, Flintshire, CH5 2UL, and is centred at National Grid Reference SJ 29703 71233.

1.1.3 The proposed variation comprises the installation of a second limited-hours peaking plant at the Site, similar in design and operation to the existing peaking plant. The new plant will comprise 11 natural gas-fuelled reciprocating engines with an aggregate electrical output of 49.9 MW. Each engine will have a net rated thermal input of 9.896 MWth, giving a combined net rated thermal input of approximately 217.712 MWth for the 22 engines.

1.1.4 The engines will generate electricity only and will operate when required to support electricity supply, system balancing and stability of the National Grid. Operation will be limited to up to 1,500 hours per annum, subject to the limits specified in this permit variation application.

1.1.5 The second peaker plant will participate in National Grid's Short-Term Operating Reserve (STOR) programme, providing electricity during periods of peak demand. It will generally operate between 07:00–10:00 and 16:00–19:00, with higher demand anticipated during the winter months (November–February). The Facility will typically remain on standby and will be dispatched remotely by National Grid when required.

1.1.6 The existing STOR arrangements at the Site demonstrate the type of flexible generation service that may be required. The proposed peaking plant will operate on an equivalent standby and dispatch basis, responding remotely to National Grid instructions as required.

1.2 Reliability of Information

1.2.1 This report has been prepared using information obtained from a range of sources, including information provided by third parties. Caulmert Limited cannot guarantee the accuracy or reliability of information supplied by others. The findings and conclusions presented herein are based on the information available at the time of preparation. Should additional information become available, this may affect the conclusions of the report, and Caulmert Limited accepts no responsibility for any such subsequent changes.

1.3 Site Location

1.3.1 Deeside Power Station is located on Weighbridge Road within Deeside Industrial Park, Deeside, Flintshire, approximately centred at NGR SJ 29703 71233.

1.3.2 The Site is accessed directly from Weighbridge Road, which connects to the wider highway network (i.e., M56) via the A548 and A494, providing suitable access for operational traffic and maintenance vehicles.

1.3.3 The Site is surrounded by established industrial infrastructure and hardstanding, with site drainage system designed to manage surface water runoff. Clean, uncontaminated surface water from the site discharges through W1 as indicated in the existing environmental permit for the site.

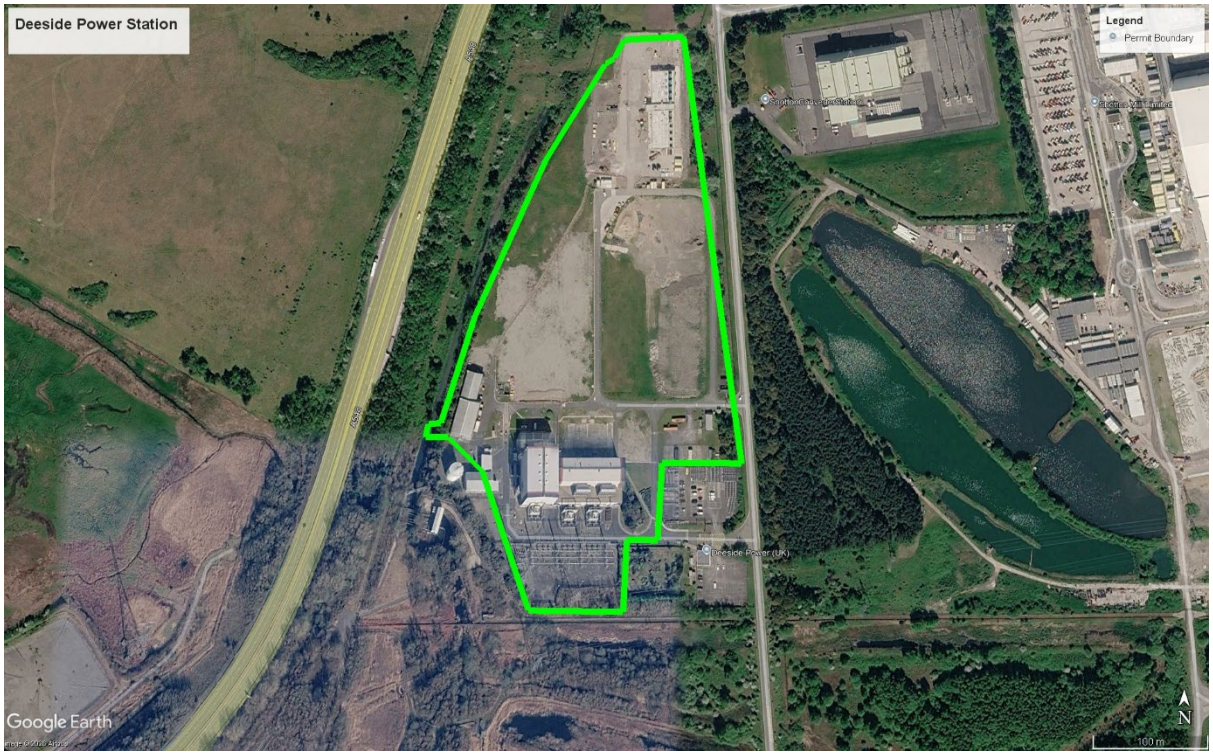


Figure 1: Site Location Plan (approximate permit boundary in green).

2.0 PROPOSED DEVELOPMENT

2.1 Proposed Peaking Plant

2.1.1 The selected engine technology for the additional peaking plant is consistent with that already installed at the Site, comprising Jenbacher J624 engines, which are two-stage turbocharged V24-cylinder gas engines. Natural gas for the engines will be supplied from the National Transmission System.

2.1.2 Each new engine will have a net rated thermal input of 9.896 MWth, resulting in a combined net rated thermal input of 108.856 MWth for the 11 engines. Each engine will be housed within an individual, fully enclosed, concrete-sided structure. Each enclosure will be fitted with a waste heat radiator, ventilation air inlet, ventilation air outlet and an exhaust stack with silencer. The engines will be located on impermeable concrete hardstanding.

2.1.3 The proposed site layout is shown on drawing reference 7139-CAU-XX-XX-DR-V-1802, which is included within the Drawings section of this document.

2.1.4 Electricity generated by the proposed plant will be routed to the pre-existing transformers at the Site prior to export to the National Grid. It is anticipated that the proposed engines will operate for 1,500 hours per annum on 5 year average with 2250 hours maximum for the provision of standby electricity generation.

2.1.5 In practice, the electrical output and operating hours of the engines will vary depending on National Grid requirements. Individual engines may remain dormant while others are generating electricity, and engines may be operated at variable loads where required to meet demand.

2.1.6 This CHP assessment considers the potential for beneficial use of heat produced during operation of the proposed plant, in addition to the generation of electricity.

2.1.7 The proposed peaking plant has been designed to provide rapid response electricity generation services to the National Grid. The use of smaller, modular reciprocating gas engines is considered appropriate for this type of flexible generation, having regard to cost, availability, operational performance and the requirement for rapid start-up and shut-down.

2.1.8 The configuration allows individual engines to be operated at optimum load, thereby maintaining efficiency, while other engines remain dormant when not required. This arrangement is consistent with other comparable installations within the sector.

2.1.9 At maximum continuous rating (MCR), or full load, the plant will achieve a gross electrical efficiency of 45.5%. Electrical efficiency remains relatively high at part load, reducing by approximately 1.1% at 75% load and 3.5% at 50% load, when compared with operation at 100%

load. The theoretical maximum recoverable thermal energy output for each engine is 2.838 MWth at full load.

2.2 Proposed Activities

2.2.1 The Schedule 1 activity undertaken at the Site and affected by this variation is:

- Section 1.1 Combustion activities, Part A(1)(a): burning any fuel in an appliance with a rated thermal input of 50 MW or more.

2.2.2 The proposed variation will add a second peaking plant comprising 11 Jenbacher J624 natural gas-fired reciprocating engines identical to those already installed. The plant will have an aggregate electrical output of 49.9 MW and a combined net rated thermal input of 108.856 MW_{th}.

2.2.3 The new engines will generate electricity for export when called upon to support electricity supply, system balancing and National Grid stability. Their operation will be limited to no more than 1,500 hours per year, subject to the limits and conditions set out in this variation application.

2.2.4 Natural gas will be supplied on demand from the mains network; no bulk natural gas storage on site is proposed.

2.2.5 Each engine will be installed in an enclosed concrete-sided unit on impermeable hardstanding, incorporating the necessary cooling, ventilation, exhaust and noise-control equipment. These arrangements will provide containment, safe access and control of potential emissions.

2.2.6 The plant will be integrated with the site's existing distributed control system (DCS) and electrical infrastructure. Key operating parameters and alarms will be monitored from the continuously staffed control room, while electricity will pass through the existing transformers before export to the National Grid. Operation and maintenance will be undertaken in accordance with the Operator's environmental management system, manufacturer requirements and permit conditions.

2.2.7 Except for the addition of 11 engines, the activities listed in Table 1 remain unchanged. Each engine will have a net rated thermal input of 9.896 MWth, resulting in a combined net rated thermal input of 217.712 MWth across all 22 engines.

2.2.8 The storage provisions associated with directly associated activities AR4 (waste oil management) and AR5 (storage and handling of raw materials and fuel) will be doubled, as shown in Table 2, to serve 22 engines. The diesel storage provision will remain unchanged.

3.0 REGULATORY CONTEXT AND SCOPE OF REPORT

3.1 Schedule 24 of the Environmental Permitting Regulations

3.1.1 Schedule 24 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) implements the relevant requirements of Article 14 of the Energy Efficiency Directive (2012/27/EU). Section 2(3) of Schedule 24 confirms the requirements applicable to electricity generating installations seeking a variation to an environmental permit, stating:

> '*The regulator must ensure that an application for a variation of an environmental permit required by sub-paragraph (2) contains (in addition to the information required by paragraph 2(1)(b) of Schedule 5) a cost-benefit analysis which assesses the cost and benefits of converting the relevant installation to high-efficiency cogeneration.'*

3.1.2 Schedule 24 defines a cost-benefit analysis within Section 1(1) as follows:

> '*cost-benefit analysis" means a cost-benefit analysis in accordance with Part 2 to Annex IX to the Energy Efficiency Directive*'

3.1.3 High-efficiency cogeneration is also defined within Section 1(1), as follows:

> '*high-efficiency cogeneration" means cogeneration meeting the criteria laid down in Annex II to the Energy Efficiency Directive*'

3.1.4 Section 2(4) of Schedule 24 provides an exemption for peak load and back-up generating relevant installations, 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 1,500 operating hours per year as a rolling average over a period of 5 years is planned.'*

3.1.5 On this basis, as the proposed operation of the peaking plant will be limited to 1,500 operating hours per annum as a rolling average over five years, the exemption under Schedule 24 is applicable and a cost-benefit analysis is not required.

3.2 Energy Efficiency Directive

3.2.1 The retained Energy Efficiency Directive (2012/27/EU) established a common framework of measures to promote energy efficiency, support achievement of the European Union's 2020 headline energy efficiency target and provide a basis for further improvements in energy efficiency beyond that date.

3.2.2 Article 14(2) of Chapter III, which concerns efficiency in energy supply, addresses the promotion of efficient heating and cooling and states:

> '*Member states shall adopt policies which encourage the due taking into account at local and regional levels of the potential of using efficient heating and cooling systems, in particular those using high-efficiency co-generation.'*

3.2.3 Efficient heating and cooling are defined as systems which:

'*compared to a baseline scenario reflecting business-as-usual situation, measurably reduces the input of primary energy needed to supply one unit of delivered energy….in a cost-effective way, as assessed in the cost benefit analysis.'*

3.2.4 Article 14(5) further 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;'*

3.3 Natural Resources Wales Guidance

3.3.1 There is no available NRW guidance for Large Combustion Plants. However, NRW guidance titled 'What to do before you apply for a standalone Medium Combustion Plant (MCP) less than 50 MW thermal input that is also a Specified Generator (SG) or Part B activity' provides relevant information on the requirements for energy efficiency reports. The guidance states that, where a combustion plant has a total thermal rated input of 20 MWth or more and produces waste heat at a useful temperature, applicants must meet the requirements of Schedule 24 of the Environmental Permitting Regulations.

3.3.2 The guidance page provides a link to the Environment Agency guidance 'Energy efficiency standards for industrial plants to get environmental permits' (last updated 15 July 2019). This guidance sets out how applicants may demonstrate compliance with energy efficiency standards and states:

> *'If you're planning a new power station or energy from waste plant then you will need to make sure you comply with the Environment Agency's CHP-Ready guidance.'*

3.3.3 The CHP-R guidance applies to Environmental Permit applications made under the Environmental Permitting (England and Wales) Regulations 2010 for:

- New combustion power plants with a total rated thermal input of more than 20MW[1]; and
- New EFW plants with a throughput of more than 3 tonnes per hour of non-hazardous waste or 10 tonnes per day of hazardous waste[2].

3.3.4 This assessment has also had regard to the Environment Agency draft guidance 'Cost-benefit assessment for combustion installations: Draft guidance on completing cost-benefit assessments for installations under Article 14 of the Energy Efficiency Directive', V0.9, April 2015, where relevant.

3.4 Assessment Structure and Methodology

3.4.1 Chapter 2 of the CHP-R guidance sets out the methodology and approach for undertaking a CHP-R Assessment. Requirement 1, titled 'Plant, Plant Location and Potential Heat Loads', identifies the information to be provided at the initial stage of the assessment. The required demonstrations comprise:

- 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 MWth;
- The appropriate selection of heat loads 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.

3.4.2 The following section provides the information required under Requirement 1 of the CHP-R guidance. It demonstrates that the Operator has considered the potential use of high-efficiency cogeneration (CHP), including the technical and economic viability of exporting heat to off-site users.

3.4.3 Requirement 1 of Appendix A of the CHP-R Guidance: CHP-R Assessment Form has been completed and is presented in **Appendix 1** of this report.

[1] Energy efficiency standards for industrial plants to get environmental permits - GOV.UK
[2] Environmental permitting guidance: waste incineration - GOV.UK

4.0 COST BENEFIT ASSESSMENT

4.1 Overview

4.1.1 The proposed plant comprises a second 49.9 MW peaking plant, consisting of 11 natural gas-fired reciprocating engines. The second plant will be installed within the existing Deeside Power Station and will double the existing peaking plant generation capacity and number of engines.

4.1.2 The proposed peaker plant will have a combined thermal input of 108.856 MWth and, based on the manufacture's performance data, a theoretical maximum recoverable thermal energy output of approx. 31.218 MWth at full load. When considered alongside the existing peaking plant, which has an equivalent theoretical recoverable heat output, the two plants could provide approximately 62.436 MWth of theoretical recoverable heat at full load.

4.1.3 This represents an increase in the scale of potential heat availability at the Site; however, the figure represents the theoretical maximum recoverable heat during full-load operation and does not represent a continuous or guaranteed heat supply.

4.1.4 This CHP Ready Assessment has been prepared with reference to, and builds upon, the existing CHP Ready Assessment for Deeside Power Station under Environmental Permit EPR/XP3131VK/V003 (Ref. CRM.343.006.PE.R.001).

4.1.5 The previous assessment remains directly relevant because the proposed plant will use the same technology and will serve the same operational purpose as the existing peaking plant. In particular, it will operate as a flexible, limited-hours generating facility dispatched in response to National Grid requirements, rather than in response to local heat demand.

4.1.6 The previous assessment has therefore been reviewed to determine whether the addition of the second plant introduces any different CHP opportunities. Although the proposed development approximately doubles the quantity of potentially recoverable heat, the constraints affecting CHP viability remain unchanged.

4.1.7 As with the existing facility, operation of the proposed plant will be determined by National Grid dispatch requirements rather than local heat demand. The plant will generally operate during periods of peak electricity demand and system balancing, typically between 07:00-10:00 and 16:00-19:00, with higher utilisation anticipated during winter months.

4.1.8 Actual operating hours, duration and electrical output cannot be predicted with certainty and may vary significantly from year to year. Individual engines may remain dormant while others are generating, and engines may be operated at variable loads where required to meet demand.

4.1.9 The intermittent and unpredictable operational profile of peaking generation presents a significant constraint to the practical implementation of Combined Heat and Power (CHP).

4.1.10 Whilst the recovery of waste heat from reciprocating engines is technically feasible, viable CHP schemes typically require a dependable and continuous heat demand capable of accepting heat whenever it is available. In the case of peaking generation, heat availability is governed by electricity system requirements rather than by the needs of a heat customer.

4.1.11 The addition of the second plant increases the quantity of heat that could theoretically be recovered when the engines are operating but does not alter the intermittent nature or predictability of that heat availability.

4.1.12 The Environment Agency CHP-R Guidance recognises this limitation and notes that, whilst CHP may be technically feasible for most combustion plant technologies, there are circumstances where CHP is incompatible with the intended operational role of the installation, including peaking power plants.

4.1.13 Potential heat users within the surrounding area, including residential, commercial and industrial developments, would generally require a reliable and predictable heat supply.

4.1.14 The proposed plant would be unable to guarantee such supply because operation will remain dependent upon National Grid dispatch requirements. A heat user requiring continuity of supply would therefore require substantial thermal storage, supplementary heat generation or other measures to maintain heat availability during periods when the peaking plants are not operating.

4.1.15 Such arrangements would introduce additional infrastructure, operational complexity and cost and could reduce the overall energy and environmental benefits associated with CHP.

4.1.16 Given the limited operating hours, uncertainty of dispatch and lack of alignment between heat generation and heat demand profiles, the proposed is not considered well suited to the practical implementation of a viable CHP scheme at the current time.

4.1.17 The addition of the second plant increases the potential quantity of recoverable heat but does not improve the underlying conditions for CHP because the same operational and infrastructure constraints remain.

4.2 Site Location and CHP Readiness

4.2.1 The CHP-R Guidance recognises that site selection for electricity generation facilities is influenced by a range of technical, environmental and commercial considerations. For peaking power plants in particular, the availability of suitable electrical grid infrastructure and gas supply connections is often the primary determining factor.

4.2.2 The proposed development is located within the existing Deeside Power Station site, which benefits from established connections to both the National Gas Transmission System and National Grid electrical infrastructure.

4.2.3 The use of the existing operational power station site enables the proposed development to utilise existing infrastructure, minimise additional land take and reduce the need for significant off-site works.

4.2.4 The Site is located within Deeside Industrial Park, an established industrial area where electricity generation activities are already present. Existing transformers, electrical switchgear and grid connection infrastructure can therefore be utilised by the proposed development.

4.2.5 The location of the second plant is therefore primarily associated with the existing electricity generation infrastructure and does not reflect the presence of a specific heat demand.

4.2.6 Consistent with the approach adopted in the original CHP Ready Assessment (Ref. CRM.343.006.PE.R.001), consideration has been given to existing and future heat users in the vicinity of the Site.

4.2.7 No viable CHP opportunities were identified in the previous assessment, and the review undertaken for the proposed variation has not identified a suitable heat network or a heat demand with characteristics that would provide a technically and economically viable match with the intermittent operation of the peaking plants.

4.2.8 The addition of the second plant increases the potential quantity of recoverable heat but does not alter the location of the Site or the relationship between heat generation and local heat demand.

4.2.9 The Operator will continue to keep potential CHP opportunities under periodic review in accordance with the principles of CHP readiness and Best Available Techniques (BAT).

4.2.10 Should a suitable heat user, heat network or other beneficial heat utilisation opportunity emerge during the operational lifetime of the plants, the increase potential heat availability could be considered as part of any future assessment.

4.3 Theoretical Heat Demand Search Radius

4.3.1 The proposed development qualifies for exemption from the Schedule 24 Cost Benefit Analysis (CBA) requirements because operation will be restricted to no more than 1,500 hours per annum, assessed as a rolling five-year average, consistent with the operating restriction applicable to the existing peaking plant

4.3.2 Notwithstanding this exemption, the assessment considers the potential beneficial use of recoverable heat from the proposed plant

4.3.3 This assessment draws on the findings of the CHP Ready Assessment prepared for Deeside Power Station in February 2026 (Ref. CRM.343.006.PE.R.001), which reviewed potential heat demands in the surrounding area.

4.3.4 The site characteristics, surrounding land uses and operational principles considered in that assessment remain unchanged. The proposed variation adds a second plant of the same type and does not introduce a different generation technology or operating regime.

4.3.5 For installations with a thermal input below 300 MWth, CHP-R Guidance recommends consideration of potential heat demands within an indicative search radius of up to 10 km.

4.3.6 The previous assessment considered heat demand within this area and concluded that no realistic CHP opportunities were available which could be supplied in a technically and economically viable manner.

4.3.7 Any potential heat utilisation opportunity must demonstrate not only sufficient heat demand but also compatibility between the heat demand profile and the availability of recoverable heat from the generating plant.

4.3.8 In the case of a peaking facility, this compatibility is particularly difficult to achieve due to the irregular and non-continuous operating regime. Increasing the number of engines does not remove this constraints because the timing and duration of operation remain dependent upon National Grid requirements.

4.3.9 The conclusions of the previous CHP Ready Assessment therefore remain applicable to the proposed installation because the additional peaking plant will operate in an equivalent manner to the existing facility and will be subject to the same operational constraints.

4.4 Review of Previous Assessment Findings

4.4.1 The CHP Ready Assessment undertaken for the existing facility (Ref. CRM.343.006.PE.R.001) reviewed potential heat demand opportunities within the surrounding area, including consideration of planning developments, industrial users and district heating opportunities.

4.4.2 That assessment identified practical challenges associated with undertaking a comprehensive planning review across the full 10 km search radius due to the large number of planning applications and the limitations of the local planning authority search function in differentiating developments by scale or heat demand potential.

4.4.3 Taking account of the characteristics of the proposed peaking plant, including its intermittent operation and limited hours of use, the previous assessment concluded that there were no immediately viable heat loads capable of supporting a technically and economically feasible CHP scheme.

4.4.4 The proposed second plant does not introduce a change to the operational characteristics that led to that conclusion. It will use identical technology, operate under the same limited-hours regime and respond to the same National Grid dispatch requirements.

4.4.5 The principal change is therefore one of scale rather than operational character. The proposed variation increases the installed generation capacity, number of engines and theoretical recoverable heat available when the plant is operating, but does not provide more reliable or predictable source of heat.

4.4.6 The assessment further concluded that future CHP opportunities should continue to be reviewed throughout the operational lifetime of the plant and that CHP readiness represented the most appropriate approach where no viable heat off-take opportunity currently exists.

4.4.7 Following review of the previous assessment and consideration of the current permit variation proposal, the Operator considers that these conclusions remain valid and applicable to the proposed development.

4.5 District Heating Networks

4.5.1 The previous CHP Ready Assessment (Ref. CRM.343.006.PE.R.001) reviewed the Association for Decentralised Energy (ADE) District Heating Map to identify existing and proposed district heating schemes within the vicinity of the Site.

4.5.2 No existing or proposed district heating networks were identified within the indicative assessment area.

4.5.3 Accordingly, no district heating opportunities were identified that could reasonably utilise recoverable heat generated by the proposed peaking plant.

4.5.4 A review of publicly available information undertaken for the purposes of this assessment has not identified any changes that would alter the conclusions reached within the previous CHP Ready Assessment.

4.5.5 The proposed plant would increase the quantity of heat that could potentially be available to a future network when operating, but no suitable network has been identified to receive that heat.

4.5.6 Should a suitable district heating network or other heat distribution infrastructure be developed in the future, its compatibility with the intermittent operating regime of the peaking plants would need to be assessed.

4.5.7 In particular, consideration would need to be given to heat demand profiles, thermal storage requirements, supplementary heat sources and the economic viability of the necessary infrastructure.

4.6 Review of Heat Demand Information

4.6.1 The previous CHP Ready Assessment (Ref. CRM.343.006.PE.R.001) included a review of theoretical heat demand information derived from the BEIS CHP Development Map and associated datasets. This review considered industrial, commercial and domestic heat demand within both 3 km and 10 km radius of the Site.

4.6.2 The assessment identified a number of industrial heat users within the wider area; however, it concluded that the intermittent and unpredictable availability of waste heat from the peaking plant would prevent reliable matching of supply and demand profiles.

4.6.3 The proposed second plant does not change these constraints. Although the quantity of potentially recoverable heat increases, heat will continue to be available only when the engines are dispatched for electricity generation.

4.6.4 Furthermore, it was considered unlikely that the low-grade heat recoverable from the engines would be suitable for many industrial process applications without additional upgrading infrastructure.

4.6.5 The addition of the second plant does not remove this technical constraint.

4.6.6 The previous assessment therefore concluded that no technically feasible or economically viable industrial heat utilisation opportunities existed.

4.6.7 Following review, these conclusions remain applicable to the proposed development. The increase in theoretical recoverable heat does not, in itself establish a compatible industrial heat demand or improve the economic or technical case for heat export.

4.6.8 Similarly, whilst domestic heat demand exists within the wider area, no existing or proposed district heating infrastructure has been identified through which such demand could be served.

4.6.9 Consequently, utilisation of waste heat for domestic heating purposes is not currently considered technically or economically feasible.

4.6.10 The proposed second peaking plant does not alter this conclusion because the fundamental issue remains the mismatch between intermittent heat availability and the requirement for a reliable domestic heat supply.

4.7 Cost Benefit Analysis

4.7.1 Schedule 24 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) requires a Cost Benefit Analysis (CBA) to be undertaken for certain combustion installations

exceeding 20 MW thermal input where waste heat may be available for recovery and beneficial use.

4.7.2 However, Schedule 24 also provides an exemption for peak-load and back-up generating installations where operation of less than 1,500 hours per annum, assessed as a rolling average over five years, is proposed.

4.7.3 The proposed peaking plant is intended to operate within this exemption threshold and therefore a formal Cost Benefit Analysis is not required.

4.7.4 Notwithstanding the exemption, this assessment has reviewed the conclusions of the previous CHP Ready Assessment (Ref. CRM.343.006.PE.R.001) and considered whether the addition of the second plant changes the assessment of CHP potential.

4.7.5 The proposed development increases the quantity of potentially recoverable heat available when the additional engines are operating. However, the same constraints remain applicable, including intermittent National Grid dispatch, limited operating hours, unpredictable heat availability, the absence of an identified suitable heat network and the absence of an identified compatible heat demand.

4.7.6 On this basis, no viable heat utilisation opportunities have been identified that would justify the operation of the installation as a high-efficiency cogeneration facility.

4.8 CHP Readiness of the Plant

4.8.1 Although no viable CHP opportunity has been identified, the proposed peaking plant has been designed to maintain an appropriate degree of CHP readiness in accordance with the principles of the CHP-R Guidance.

4.8.2 The proposed Jenbacher J624 gas engines are inherently capable of integration with heat recovery systems. Should a viable heat demand arise in the future, additional heat recovery equipment could be installed to recover thermal energy from engine cooling and exhaust systems.

4.8.3 As identified within the previous CHP Ready Assessment (Ref. CRM.343.006.PE.R.001), installation of containerised heat recovery equipment above or adjacent to the generating units would be technically feasible, subject to detailed design, planning and permitting requirements applicable at that time.

4.8.4 Provision has been made within the proposed development to allow future installation of heat export pipework should a viable off-site heat user emerge during the operational lifetime of the plant.

4.8.5 The potential for future heat utilisation would therefore remain subject to the identification of a suitable heat demand and the resolution of the technical and economic constraints associated with intermittent heat availability.

4.8.6 Based on the engine manufacturer's performance data, approximately 31.218 MWth of recoverable thermal energy could theoretically be made available from the proposed additional 11 engines at full load operation.

4.8.7 The existing peaking plant comprises an equivalent engine configuration and therefore provides an equivalent theoretical maximum recoverable heat output. On this basis, the two peaking plants could theoretically provide approx. 62.436 MWth of recoverable heat at full load when considered together.

4.8.8 This figure represents the theoretical maximum heat availability from the combined peaking generation facilities during full-load operation. It should not be interpreted as a continuous or guaranteed heat supply, as actual heat availability will depend on National Grid dispatch requirements, engine loading and the operating hours of the plants.

4.8.9 The addition of the second plant increases the overall theoretical heat availability from the site's peaking generation facilities. However, it does not improve the predictability or reliability of heat availability.

4.8.10 Both plants will remain subject to the same fundamental operating characteristics, including intermittent National Grid dispatch, limited annual operating hours and variable engine loading. Consequently, the timing and duration of heat availability will remain uncertain and driven by electricity system requirements rather than heat demand.

4.8.11 The installation of future heat recovery equipment would not reduce the electrical generating capacity of the plant. However, it may affect operational flexibility, start-up times and shutdown characteristics, which are critical requirements for the provision of STOR and other balancing services.

4.8.12 Any future CHP scheme would therefore need to demonstrate that heat recovery and export arrangements could be implemented without compromising the primary purpose of the installation as a rapid-response peaking facility.

4.8.13 Accordingly, and having regard to the conclusions of both this assessment and the original CHP Ready Assessment (Ref. CRM.343.006.PE.R.001), the proposed level of CHP readiness is considered proportionate and appropriate.

4.8.14 The proposed variation increases the scale of generation capacity and theoretical recoverable heat, but does not alter the nature, reliability or viability of CHP opportunities previously identified for the site.

4.8.15 The absence of any current or planned heat network, the lack of an identified compatible heat demand, the intermittent operating regime and the uncertainty associated with National Grid dispatch remain the main constraints to the practical implementation of CHP.

4.8.16 The Operator will continue to review potential heat utilisation opportunities during the operational lifetime of the installation should changes in local heat demand, heat networks, technology or operating arrangements provide a technically and economically viable opportunity for beneficial heat utilisation.

5.0 REFERENCES

5.1.1 Environmental Permitting (England and Wales) Regulations 2016, SI 2016/1154 (11 December 2016; as amended).

5.1.2 European Parliament and Council, Directive 2012/27/EU of 25 October 2012 on energy efficiency, Official Journal L 315 (published 14 November 2012).

5.1.3 Natural Resources Wales, "What to do before you apply for a standalone Medium Combustion Plant (MCP) less than 50 MW thermal input that is also a Specified Generator (SG) or Part B activity" (published 26 June 2025).

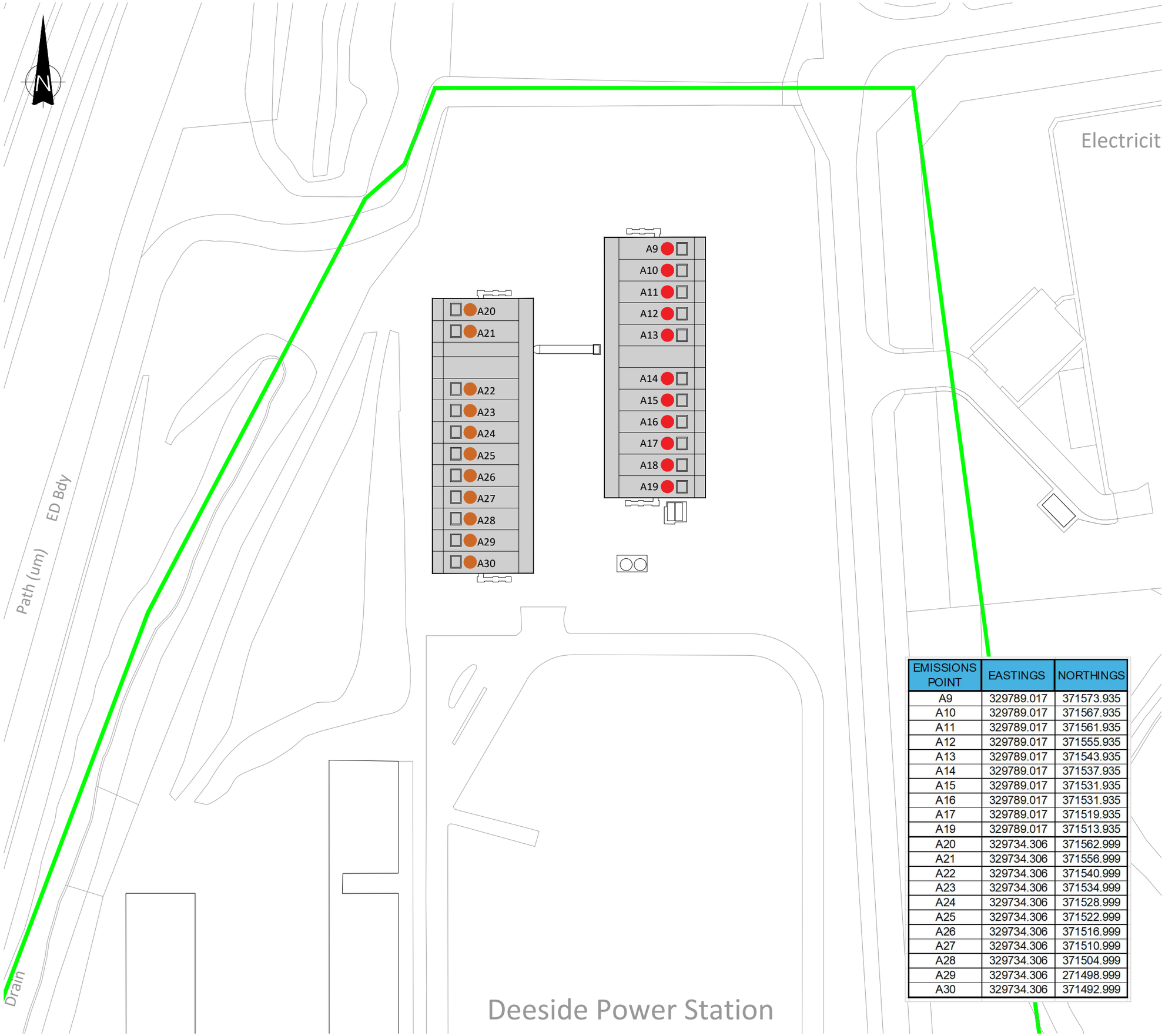
5.1.4 Environment Agency and Department for Environment, Food & Rural Affairs, "Energy efficiency standards for industrial plants to get environmental permits" (published 1 February 2016; last updated 15 July 2019).

5.1.5 Environment Agency, *CHP Ready Guidance for Combustion and Energy from Waste Power Plants*, Version 1.0 (published 25 February 2013).

5.1.6 Environment Agency, Cost-benefit assessment for combustion installations: Draft guidance on completing cost-benefit assessments for installations under Article 14 of the Energy Efficiency Directive, Version 0.9 (April 2015).

DRAWINGS

7139-CAU-XX-XX-DR-V-1802 Site Layout Plan



NOTES

1. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY. ALL DIMENSIONS ARE IN METRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS NOTED OTHERWISE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.

LEGEND

- PERMIT BOUNDARY
- PROPOSED EMISSIONS POINTS
- EXISTING EMISSIONS POINTS

EMISSIONS POINT	EASTINGS	NORTHINGS
A9	329789.017	371573.935
A10	329789.017	371567.935
A11	329789.017	371561.935
A12	329789.017	371555.935
A13	329789.017	371543.935
A14	329789.017	371537.935
A15	329789.017	371531.935
A16	329789.017	371531.935
A17	329789.017	371519.935
A19	329789.017	371513.935
A20	329734.306	371562.999
A21	329734.306	371556.999
A22	329734.306	371540.999
A23	329734.306	371534.999
A24	329734.306	371528.999
A25	329734.306	371522.999
A26	329734.306	371516.999
A27	329734.306	371510.999
A28	329734.306	371504.999
A29	329734.306	271498.999
A30	329734.306	371492.999

REV					
P01	FOR CLOPUD APPLICATION	EJD	JC	AS	09.11.26
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR CLOPUD APPLICATION
STATUS: S2

CLIENT:
DEESIDE POWER (UK) LTD
WEIGHBRIDGE ROAD, SEALAND.
DEESIDE, CH5 2UL

PROJECT:
DEESIDE POWER STATION
INSTALLATION OF
GAS POWERED PEAKING PLANT

TITLE:
SITE LAYOUT PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
EJD	EJD	JC	JC

DATE	SCALE @ A3	JOB REF:	REVISION
12.10.2026	1:1000	7139	P01

DRAWING NUMBER
7139-CAU-XX-XX-DR-V-1802

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APPENDIX 1

CHP-R Assessment Form

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#	Description	Units	Notes/Instructions
Requirement 1: Plant, Plant Location and Potential Heat Loads			
1.1	Plant Name		Deeside Power Station
1.2	Plant Description		The proposed development comprises a gas-fired standby electricity generation facility that will participate in National Grid's Short-Term Operating Reserve (STOR) programme. The facility will comprise 11 containerised spark-ignition engines, each with a rated thermal input of 9.896 MWth, fuelled by natural gas supplied from the gas grid. The plant will have a total net rated thermal input of 108.856 MWth and a total electrical output of 49.9 MWe.
1.3	Plant Location (Postcode/Grid Ref)		Deeside Power Station Weighbridge Road Deeside Industrial Park Deeside Flintshire CH5 2UL The site is centred at National Grid Reference SJ 29703 71233.
1.4	Factors influencing selection of plant location		The proposed plant will be co-located with the existing peaking plant, which is similar in design and operation and follows the same operating profile. This location enables the facilities to share supporting infrastructure where practicable and provides access to an established gas grid connection and a technically and economically viable connection to the electricity network. Generated electricity will use the site's existing electrical infrastructure, including the existing transformers, for export to the National Grid. The site is already leased to the Operator for electricity generation and is covered by an existing environmental permit.
1.5	**Operation of Plant**		

a)	Proposed operational plant load	%	100
b)	Thermal input at proposed operational plant load	MW	108.856
c)	Net electrical output at proposed operational plant load	MW	49.9
d)	Net electrical efficiency at propsoed operational plant load	%	45.5
e)	Maximum plant load	%	100
f)	Thermal input at maximum plant load	MW	108.856
g)	Net electrical output at maximum plant load	%	49.9
h)	Net electrical efficiency at maximum stable plant load		45.5
i)	Minimum stable plant load	%	50
k)	Net electrical efficiency at minimum stable plant load	%	41.9
1.6	**Identified Potential Heat Loads**		
			As with the previous assessment (Ref. CRM.343.006.PE.R.001) conclusion, there were no immediately viable heat loads capable of supporting a technically and economically feasible CHP scheme identified within 10km of the permit boundary. Theoretical heat demand from the large industrial and domestic sectors were identified within 3km. However, no suitable heat loads were identified for further assessment upon detailed analysis. See CHP report. 7139-CAU-XX-XX-RP-V-0304 for more details.

APPENDIX 2

CHP Ready Assessment ref. CRM.343.006.PE.R.001

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Combined Heat and Power Ready Assessment

Deeside Power Station Permit Variation

Deeside Power (UK) Limited

CRM.343.006.PE.R.001

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Combined Heat and Power Ready Assessment

Project	Deeside Power Station Permit Variation
For	Deeside Power (UK) Limited
Reference	CRM.343.006.PE.R.001
Date	05 February 2026
Author	Daniel Mills, Senior Permitting Consultant
Reviewer	Steph Charnaud(MCIWM BSc hons) – Director of Permitting

Revision	Date	Status	Reason for Revision
P01	05/02/2026	Final	-

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1 Introduction

1.1 Introduction

1.1.1 This Combined Heat and Power Ready (CHP-R) Assessment supports an application submitted to Natural Resources Wales (NRW) for a variation to the Environmental Permit, reference EPR/XP3131VK/V002, at Deeside Power Station, Weighbridge Road, Deeside Industrial Park, Deeside, Flintshire, CH5 2UL (the 'Facility').

1.1.2 The Operator is proposing to operate 11no. gas reciprocating engines for a maximum of 2000 hours per annum to supply electricity to the National Grid. The new plant is proposed to have a total net rated thermal input of 109MWTh.

1.1.3 The proposed Facility will participate in National Grid's Short-Term Operating Reserve (STOR) programme, providing electricity to the grid in peak demand periods. The peak operating hours of the plant will generally be between 07:00-10:00 and 16:00-19:00, with higher demand anticipated during the winter months (November - February). The Facility will typically be in standby mode and will be called upon remotely by National Grid when required to operate.

1.1.4 The Facility's Operator will remain unchanged from Deeside Power (UK) Limited (the 'Operator'), whose registered office address is; Saltend Power Station, Saltend Chemicals Park, Hedon Road, Hull, East Riding of Yorkshire, England, HU12 8GA. The company registration number is 08887001.

1.2 Site Location

1.2.1 The full address for the Facility:

Deeside Power Station

Weighbridge Road

Deeside Industrial Park

Deeside

Flintshire

CH5 2UL

1.2.2 The Facility's location is shown within Figure 1.2.1 below. The site is centred at National Grid Reference SJ 29703 71233.

Figure 1.2.1: Facility Location



©Google Earth 2026

2 Proposed Development

2.1 Proposed Plant

2.1.1 The proposed development comprises 11no. natural gas fuelled gas reciprocating engines for standby electricity provision. The gas engine technology chosen at the Facility is the Jenbacher J624 engine which is a two-stage turbocharged V24-cylinder engine. The natural gas used to fuel the engines will be supplied from the national grid.

2.1.2 Each of the new engines to be installed at the Facility will have a net rated thermal input of 9.896MWth, giving a total net rated thermal input of 108.856MWth for all 11no. engines combined.

2.1.3 Each engine will be housed within an individual fully enclosed concrete sided structures which will be fitted with a waste heat radiator, ventilation air inlet, ventilation air outlet and an exhaust stack fitted with a silencer. The 11no. of engines will be housed on impermeable concrete hardstanding.

2.1.4 The proposed site layout is shown on the drawing referenced C5682-GA-101, within the drawings section of this report

2.1.5 The electricity produced will be routed to the pre-existing transformers at the Facility before being fed into the national grid.

2.1.6 It is envisaged that all eight gensets will be required to operate for a maximum of 2,000 hours per annum for the provision of standby electricity generation. However, in practice the electrical output and operating hours of the eight gensets 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.

2.1.7 This report assess' the potential for the usage of any heat that is produced during operation in addition to the generation of electricity.

2.1.8 The Facility is specifically designed for the purpose of providing rapid response services to supply electricity to the National Grid. The use of smaller modular reciprocating gas engines is considered to be the most efficient solution (in terms of cost, availability and performance) for peaking electricity supplies due to the variable generation demand on the plant and the necessity for fast response. Utilising 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. This configuration is similar to many other installations in this sector.

2.1.9 Operating at maximum continuous rating (MCR, or full load), the plant will achieve a gross electrical efficiency of 42.3%. Electrical efficiency of the engines remains relatively high when run at variables loads, losing only 1.1% at 75% load and 3.5% at 50% load when compared to a 100% load. The total theoretically maximum recoverable thermal energy output for each engine is 2.838MWth at full load.

2.2 Proposed Permitted Activities

2.2.1 The Operator is proposing to vary their Part A Installation Environmental Permit. The listed activities to be carried out as part of this permit variation application are in accordance with the Environmental Permitting (England and Wales) Regulations 2016 (as amended 2025). Schedule 1 listed activities and Directly Associated Activities (DAA's) are summarised in Table 2.2.1 below.

Table 2.2.1: Proposed Permitted Activities

Activity	Description of Activity and WFD Annex I and Annex II operations	Limits of specified activity and waste types
Part A(1) Section 1.1 (a)	Burning of any fuel in an appliance with a net rated thermal input of 50 or more megawatts.	Combustion of natural gas in 11no gas reciprocating engines.
Directly Associated Activities		
DAA 1	Surface Water Treatment	Handling and storage of site drainage until discharge to the site surface water system.
DAA 2	Water Treatment	From capture in surface water system to discharge.
DAA 3	Waste Management	Waste generation and handling - from generation of waste to despatch from the installation
DAA 4	Storage and Handling of raw materials and fuel	From receipt of raw materials to handling, storage and use to despatch from the installation
DAA 5	Electricity transformers and 400kV banking compound	From generator to the connection to the National Grid
DAA 6	Standby emergency diesel generator	From generator to old gas turbines

3 Regulatory Context and Scope of Report

3.1 Schedule 24 of the Environmental Permitting Regulations

3.1.1 Schedule 24 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended 2019) implements the relevant requirements of Article 14 of The Energy Efficiency Directive (2012/27/EU). Section 2(3) of schedule 24 sets out how this should be achieved for electricity generating installations applying for a permit variation, stating:

'The regulator must ensure that an application for a variation of an environmental permit required by sub-paragraph (2) contains (in addition to the information required by paragraph 2(1)(b) of Schedule 5) a cost-benefit analysis which assesses the cost and benefits of converting the relevant installation to high-efficiency cogeneration.'

3.1.2 Schedule 24 provides the following definition of a cost-benefit analysis within Section1(1):

'"cost-benefit analysis" means a cost-benefit analysis in accordance with Part 2 to Annex IX to the Energy Efficiency Directive'

3.1.3 High-efficiency cogeneration is also defined within Section 1(1) as follows:

'"high-efficiency cogeneration" means cogeneration meeting the criteria laid down in Annex II to the Energy Efficiency Directive'

3.1.4 Section 2(4) of Schedule 24 sets out an exemption for the type of plant used as part of this application, 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.'

3.1.5 However, as the Facility is proposing operating hours of 2,000 per annum as a rolling average this exemption does not apply, and a cost benefit analysis is therefore required.

3.2 The Energy Efficiency Directive

3.2.1 The retained Energy Efficiency Directive (2012/27/EU) aimed to establish a common framework of measures for the promotion of energy efficiency within the European Union in order to ensure the EU's 2020 20% headline target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date.

3.2.2 Article 14(2) of Chapter III (Efficiency in Energy Supply) considers the promotion of efficiency in heating and cooling, stating:

'Member states shall adopt policies which encourage the due taking into account at local and regional levels of the potential of using efficient heating and cooling systems, in particular those using high-efficiency co-generation.'

3.2.3 Efficient heating and cooling are defined as methods that:

'compared to a baseline scenario reflecting business-as-usual situation, measurably reduces the input of primary energy needed to supply one unit of delivered energy….in a cost-effective way, as assessed in the cost benefit analysis.'

3.2.4 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;'

3.3 Natural Resources Wales Guidance

3.3.1 There is no available guidance from NRW for Large Combustion Plants. However, the NRW guidance 'What to do before you apply for a standalone Medium Combustion Plant (MCP) less than 50 MW thermal input that is also a Specified Generator (SG) or Part B activity' provides information on the requirements of energy efficiency reports. The guidance states that if the combustion plants total thermal rated input is 20MWth or more and produces waste heat at a useful temperature applicants must meet Schedule 24 of the environmental permitting regulations.

3.3.2 The guidance page provides a link to the Environment Agency guidance 'Energy efficiency standards for industrial plants to get environmental permits'. This webpage provides details on how to meet the energy efficiency standards and states:

'If you're planning a new power station or energy from waste plant then you will need to make sure you comply with the Environment Agency's CHP-Ready guidance.'

3.3.3 The CHP-R guidance applies to applications for Environmental Permits under the Environmental Permitting (England and Wales) Regulations 2010 for:

- New combustion power plants with a gross rated thermal input of 50 or more MW; and
- New EFW plants with a throughput of more than 3 tonnes per hour of non-hazardous waste or 10 tonnes per day of hazardous waste.

3.3.4 The assessment has also considered draft Environment Agency guidance 'Cost-benefit assessment for combustion installations: Draft guidance on completing cost-benefit assessments for installations under Article 14 of the Energy Efficiency Directive', V0.9 April 2015, where relevant.

3.4 Assessment Structure and Methodology

3.4.1 Chapter 4 of the CHP-R guidance sets out the methodology and approach to the CHP-R Assessment. Requirement 1 of the guidance, titled 'Plant, Plant Location and Potential Heat Loads', sets out the demonstrations required under this initial step. The demonstrations required consist of the following:

- 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 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.

3.4.2 The following section of this provides details of the information set out under requirement 1 of the CHP-R guidance. The report seeks to demonstrate that the Operator has explored the potential for using high efficiency co-generation (CHP) and have considered the technical and economic viability of exporting heat to off-site users.

3.4.3 Requirement 1 of Appendix A of the CHP-R Guidance: CHP-R Assessment Form has also been completed and is included as Appendix 2 of this report.

4 Cost Benefit Assessment

4.1 Overview

4.1.1 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 2,000 operating hours per annum for the Facility, in reality the plant may operate significantly less than this and frequently at a reduced electrical output. In practise, the operator has no control over the operating hours of the plant (if any) which are determined by the requirements of National Grid who control the plant remotely and as such how much energy would be available and at what time. The intermittency of generation is also relevant when considering the feasibility of the units acting as CHP's, with peak periods of operation anticipated between 07:00-10:00 and 16:00-19:00, and higher operating hours envisaged during the winter months than in the summer. However no operational hours are guaranteed.

4.1.2 The intermittent, unpredictable and variable nature of this generation makes utilising CHP for this type of activity (peaking electricity supplies) problematic, as a primary requirement of viable and effective CHP scheme is that it can service the heat demand of a particular user, and therefore have certainty of energy off take. The CHP-R guidance acknowledges 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.'

4.1.3 Heat demand profiles in the area, such as domestic properties and commercial and industrial users, will require a steady and guaranteed supply of heat throughout the day for space heating (and frequently also at night) and would therefore need to significantly 'top-up' and back up any heat received from the Facility. Additionally, larger industrial users identified as having significant theoretical heat demand would require heat for on-site processes at temperatures far in excess of the low-grade heat recoverable from the proposed Facility.

4.1.4 Schedule 24 of the environmental permitting regulations states that if the plant's total thermal rated input is 20MWth or more and produces waste heat at a useful temperature you must carry out a cost-benefit analysis.

4.1.5 The Environment Agency guidance 'Cost-benefit assessment for combustion installations' defines a useful temperature as follows:

'In order to determine whether the installation is producing waste heat at a "useful temperature" you should firstly determine whether it is technically

feasible to recover the heat in the form of hot water or steam and then see whether there are any heat loads within the appropriate distance which can use the heat at this temperature.

District heating schemes in the UK will generally require waste heat at a temperature of 65 ºC or more which is most likely to arise from high-temperature industries e.g. glass, cement etc.'

4.1.6 Due to the difficulties in matching supply and demand profiles for heat, it is difficult for the Operator to enter into commercial contracts with end users of heat without the 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. 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 relatively 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 and actual availability.

4.2 Site Location and CHP Readiness

4.2.1 With regards to the location of the plant, Section 4.1 Requirement 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.'

4.2.2 This is an important consideration for plants such as that proposed, as the location of these developments is 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 National Planning Policy. The proposed development also requires a location away from sensitive ecological receptors and where the impacts on air quality are acceptable.

4.2.3 Section 4.1 of the guidance also states that:

'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.'

4.2.4 Consideration of the future potential CHP opportunities within the vicinity of the site have been identified within this assessment. Periodic reviews into the viability of supplying these loads will be considered in the future and the CHP readiness of the plant described. Further detail is provided within Section 4.8 of this assessment.

4.3 Theoretical Heat Demand Search Radius

4.3.1 Whilst the above confirms that the provision of CHP from peaking plant would in general not be compatible, for the purposes of the application, we have considered what viable opportunities there might be for heat usage from the Facility if this could be provided.

4.3.2 The CHP-R guidance recommends a description of the likely extent and nature of CHP opportunities (i.e. potential heat loads) in the vicinity of the proposed development. The guidance suggests an indicative search radius of 10km be used for plants under 300MW. The following resources have been used to identify theoretical heat demand with the proximity of the development:

- The Association for Decentralised Energy District Heating Networks Map[1]; and
- Department for Business Energy and Industrial Strategy UK CHP Development Map[2].

4.3.3 Once potential users of the heat are identified, two critical factors for consideration are the level of heat demand relative to supply (to ensure a suitable PES), and the compatibility of the heat demand profiles with the heat supply - significant in this case due to the unpredictable and intermittent nature of the peaking plants generation.

4.4 Planning Search

4.4.1 A review of planning applications within the vicinity of the proposed development has been undertaken using Flintshire County Councils planning portal. It is considered that a search of all applications within 10km of the development would be unfeasible as it is not possible to screen applications based on their 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 300MW, it would appear disproportionate to consider such a wide area for a plant generating up to a maximum of 108.856MW, given the quantity and quality of heat that could potentially be available.

1 https://www.theade.co.uk/resources/district-heating-installation-map
2 https://chptools.decc.gov.uk/developmentmap

4.4.2 As an alternative, guidance within Annex IX, Part 2 of the Energy Efficiency Directive has been followed, requiring potential heat loads to be identified *'taking into account rational possibilities (for example technical feasibility and distance).'* As such, all planning applications submitted within the last two years within 3km of the development site have been reviewed. Planning applications situated on the opposite side of the River Dee have been discounted as the costs associated with crossing the river would be economically unviable.

4.4.3 The search did not identify any suitable developments within 3km of the development site. The Flintshire Local Development Plan (LDP) designates the site and most of the surrounding area as Principal Employment Area PE2.

4.4.4 However, the Flintshire LDP shows Strategic Site STR3 located approximately 2.35km east southeast of the site. This area is designated for the development of 1,325 residential properties, 91.5 ha of employment land, 1.3ha commercial hub and an extension of Sealand CP school. The remaining areas within 3km of the site are not designated.

4.4.5 The technical and economic feasibility of supplying these sites is discussed further in section 4.6.

4.4.6 Any further potential future developments will be monitored as part of the periodic reviews into the viability and the CHP readiness of the plant.

4.5 Association for Decentralised Energy District Heating Networks Map

4.5.1 The Association for Decentralised Energy's (ADE) District Heating Installation map shows university, hospital and residential/commercial district heating installations across the U.K. The interactive map has been utilised to identify current and planned district heating networks within the search area.

4.5.2 No district heating networks have been identified within the 10km search area utilising this interactive map.

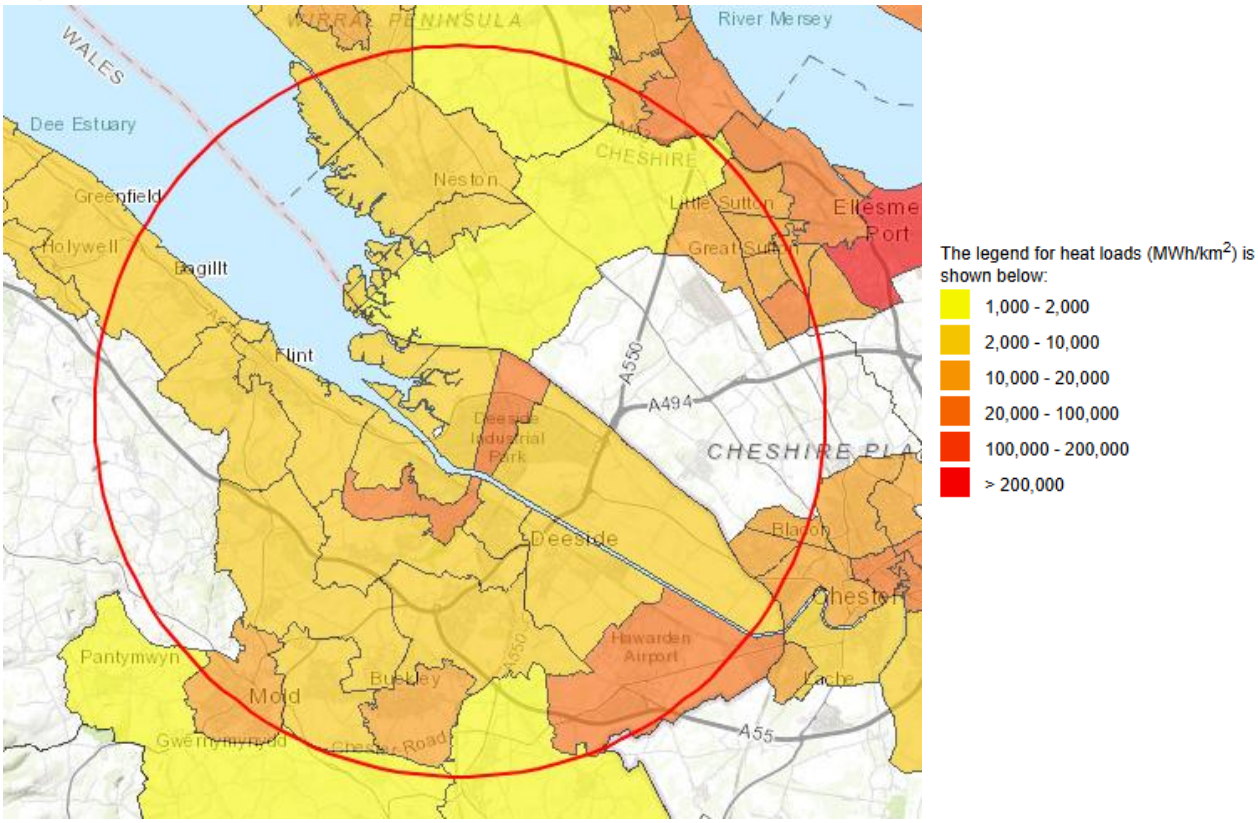
4.6 BEIS UK CHP Development Map

4.6.1 The Department for Business, Energy and Industrial Strategy's (BEIS) UK CHP Development Map is designed to geographically represent the heat demand across various sectors within the United Kingdom.

Total Theoretical Heat Demand

4.6.2 Figure 4.6.1 below is taken from the UK CHP Development Map and illustrates the total theoretical heat demand within 10km of the site, expressed as MWh/km^2.

Figure 4.6.1: Mapped Theoretical Heat Demand within 10km



4.6.3 No Large Heat Load Sites were identified within the search area on the UK CHP Development Map.

4.6.4 The breakdown of the heat demand within the search area by sector is provided in Table 4.6.2 below.

Table 4.6.2: Theoretical Heat Demand by Sector within 10km

Sector	Share of total load identified	Estimated total demand identified (MWh)
Communications and Transport	0.63%	20,007
Commercial Offices	1.02%	32,340
Domestic	41.34%	1,305,474
Education	1.10%	34,755
Government Buildings	0.15%	4,827
Hotels	0.36%	11,288
Large Industrial	47.82%	1,510,026
Health	0.50%	15,801
Other	0.18%	5,740
Small Industrial	5.52%	17,4181
Prisons	0.00%	0
Retail	1.14%	36,014

Sector	Share of total load identified	Estimated total demand identified (MWh)
Sport and Leisure	0.19%	5,976
Warehouses	0.04%	1,398
District Heating	0.00%	0

4.6.5 At this scale, the information obtained from the UK CHP Development Map is considered to have relatively limited utility for the Operator to identify economically and technically viable heat loads to service with their waste heat, due to the limited operational hours of the proposed plant. The large search area required by the guidance inevitably yields vast theoretical demand but does not provide a basis to help identify technically or economically viable opportunities to supply heat, particularly considering the absence of current or planned district heating networks in the area.

4.6.6 The capacity of the peaking plant is lower than the 300MW referenced in the CHP-R guidance, which is geared towards installations such as continuously operating large power plants and energy from waste facilities. On this basis, and as mentioned above, it seems appropriate to reduce the search area and scope of the assessment to allow for a more suitable/realistic identification of potential users of heat from the plant, given the heat that could be available.

4.6.7 The CHP-R guidance states that 'a 2009 Report for DECC on district heating networks suggested that … a district heating network using waste heat from a generating station would be cost-effective where there was a demand for 200MWth of heat within 15 km". As the maximum heat theoretically available for recovery from the proposed plant would be approximately 31.218MWth, scaling the search area down proportionally would lead to a search area of 2.3km. A new search radius of 3km was therefore considered and is discussed below.

4.6.8 A new search of theoretical heat demand within 3km of the proposed development was undertaken using the UK CHP Development Map and the results are presented below in Table 4.6.3

Table 4.6.3: Theoretical Heat Demand within 3km

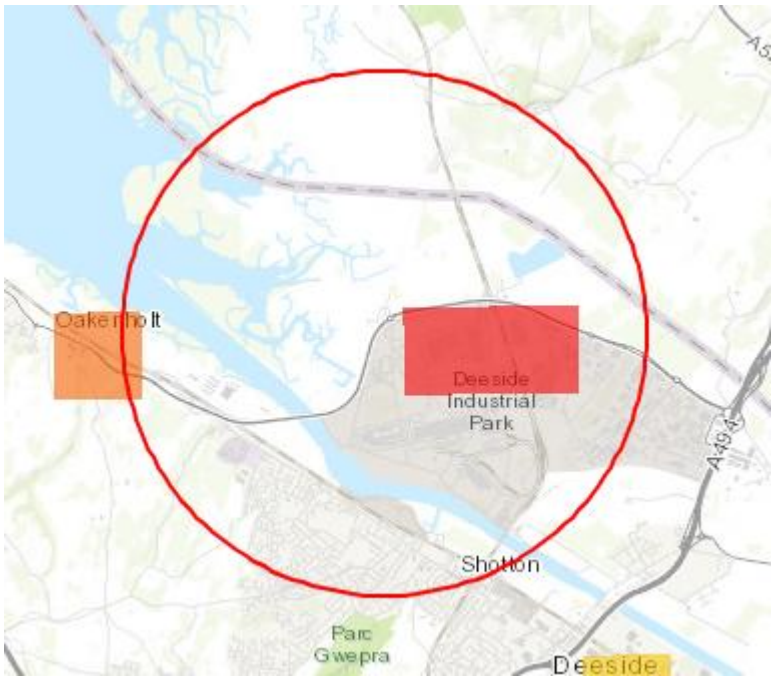
Sector	Share of total load identified	Estimated total demand identified (MWh)
Communications and Transport	1.30%	10,364
Commercial Offices	0.13%	1,052
Domestic	14.90%	118,932
Education	0.46%	3,704
Government Buildings	0.01%	60
Hotels	0.03%	245
Large Industrial	79.39%	633,519

Sector	Share of total load identified	Estimated total demand identified (MWh)
Health	0.02%	194
Other	0.01%	99
Small Industrial	3.57%	28,497
Prisons	0.00%	0
Retail	0.13%	1,071
Sport and Leisure	0.02%	198
Warehouses	0.00%	11
District Heating	0.00%	0

Large Industrial Heat Demand

4.6.9 The table above shows that the vast majority of the theoretical heat demand identified is large industrial (79.39%). The UK CHP Development Map provides a breakdown of heat demand by area, allowing identification of the approximate location of heat sources. Figure 4.6.4 below illustrates the location of heat demand from the large industrial sector in the vicinity of the site, with particularly high demand concentrated towards the centre of Deeside Industrial Park to the east of the site (in the vicinity of Shotton paper mills).

Figure 4.6.4: Mapped Theoretical Heat Demand 3km: Large Industrial Heat Loads



4.6.10 Whilst heat recovered from the Facility in the form of hot water (at approx. 120 °C) would be at a suitable temperature for a district heating network and space heating, the intermittent and unpredictable operating regime makes it difficult for the operator to enter into commercial contracts for the supply of heat with specific end users who no doubt would need certainty of supply, with a

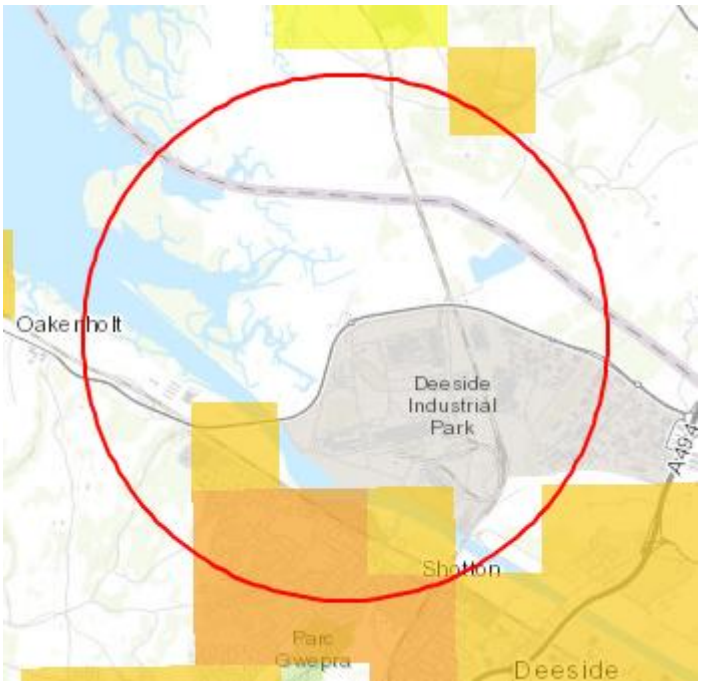
significantly greater demand than could be supplied. Another form of heat source and heating infrastructure would therefore be needed on site to top up heat received from the Facility, to cover periods when the plant is not operating. There would therefore be no PES during these times. The temperature of the waste heat available would not be at an appropriate temperature for production processes.

4.6.11 On this basis, supplying the large industrial users in the vicinity of the site has been screened out from further assessment.

Domestic Heat Demand

4.6.12 The second largest sector of theoretical heat demand identified within the study area is domestic use, with an estimated 118,932MWh representing 14.90% of total heat demand. Figure 4.6.5 below shows that this demand is primarily concentrated in the area to the south of the River Dee.

Figure 4.6.5: Mapped Theoretical Heat Demand 3km: Domestic Heat Loads



4.6.13 Although there is a significant level of theoretical heat demand identified in these areas, considering that there are no current or planned district heating networks in the area it is considered that it would be extremely impractical and highly unlikely to be economically viable for the proposed development to service these areas. Furthermore, the intermittent generation of the proposed plant makes it unlikely that the Facility could meet the heat demand profiles of residential areas even if a district heating network was present, as during cold periods when heating demand was throughout the day, end users or other

generators would need to significantly 'top up' any heat required, and the balancing of any top up would be almost impossible to predict.

4.6.14 Furthermore, given the complexities in crossing the River Dee it is highly unlikely that providing heat to users south of the river would be economically viable.

4.6.15 Therefore, further assessment of the potential to supply domestic heat loads at this point in time (including the developments within the Flintshire LDP Strategic Site STR3) has not been considered necessary. Information on the CHP Readiness of the plant is provided in Section 4.8 of this assessment, demonstrating how the plant has been designed to service existing and emerging heat loads should it become technically or economically viable in the future.

Summary

4.6.16 In accordance with the relevant guidance, this assessment has identified the nature, scale and location of theoretical heat demand within the vicinity of the site and the technical and economic feasibility of supplying these heat loads.

4.6.17 The large industrial users in the vicinity of the site represent the highest level of demand identified. However, compatibility of the demand and supply profiles of heat compromises the feasibility of supplying these users. No PES would be achieved for extended periods of time and a PES of 10% overall would not be likely to be achieved. It is unlikely that the waste heat available from the Facility would be at a 'useful temperature' for any of the users identified to utilise it in their production processes. As such, it is not considered to be 'technically feasible' to supply waste heat to any of the large industrial heat sources identified.

4.6.18 Whilst domestic demand was identified, as no current or planned district heating networks exist within the vicinity of the site it is not considered technically or economically feasible to supply domestic demand at this time. The degree of CHP-Readiness of the plant is discussed below should a network be developed in the future into which the plant could supply.

4.7 Cost Benefit Analysis

4.7.1 Article 14(5) of the energy efficiency directive states:

"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 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;"

4.7.2 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 installation to supply, coupled with the original operating intention and regime.

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

4.8 CHP Readiness of the Plant

4.8.1 The CHP-R guidance states 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.*"

4.8.2 All of the engines themselves are supplied as CHP ready units. Providing a heat recovery option for the plant would involve the installation of additional containerised heat recovery units. Heat recovery units could theoretically be placed on top of the containerised gensets. This would require some modification of the existing configuration on site but is technically possible - subject to any additional regulatory, planning and environmental permitting requirements at that time.

4.8.3 Space will be left for the installation of pipework necessary to export the heated water from the recovery units off site. This system could technically supply approximately 31.218MW of thermal energy available for recovery from the plant.

4.8.4 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 requirements providing STOR services to National Grid.

4.8.5 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 account of the lack of current or planned district heating networks in the vicinity of the site.

5 Conclusion

5.1 Conclusions

5.1.1 Deeside Power (UK) Limited are proposing to vary their existing environmental permit and construct a new 109MWth gas powered standby generation facility at Deeside Power Station.

5.1.2 The plant will participate in the National Grid's Short-Term Operating Reserve scheme, providing electricity to the grid in peak demand periods. It is anticipated that the plant will be required to operate for a maximum of 2000 hours per annum, as required by National Grid who will control the plant remotely.

5.1.3 The plant has been designed for rapid response and for operation at variable loads. The choice of technology and site configuration is considered the most effective solution to utilise the electrical and gas grid connections and the existing infrastructure, including transformers, at this location.

5.1.4 New power generation facilities with an aggregated thermal input over 20MWth require the submission of a report showing how the new facility will meet the requirements of Schedule 24, or to provide an explanation of why Schedule 24 does not apply in their case. Environment Agency guidance - CHP Ready guidance for Combustion and Energy from Waste Power Plants and Cost-benefit assessment for combustion installations: Draft guidance on completing cost-benefit assessments for installations under Article 14 of the Energy Efficiency Directive has been referred to as good practice where applicable and requirement 1 and steps 1-3 respectively have been completed. Considering the smaller scale and operating intention of Facilities envisaged by the guidance above, the scope of the assessment has been adjusted accordingly.

5.1.5 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."

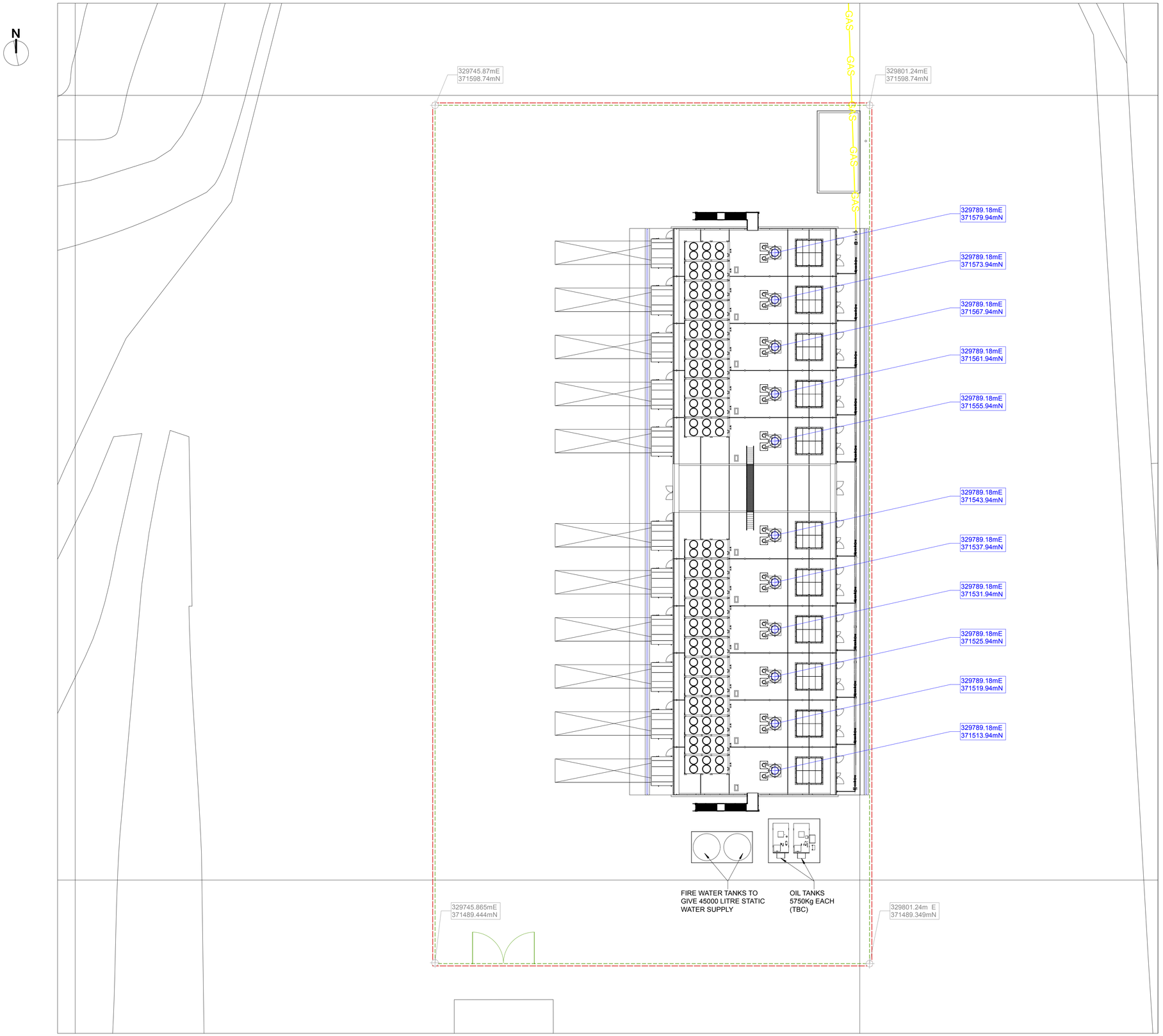
5.1.6 No local district heating networks or suitable heat off takers have been identified in this assessment that would be suitable and economically viable given the type of facility and the amount of heat available. Therefore, and in accordance with Article 14(5), a cost benefit analysis is not required for the proposed development.

5.1.7 The engines are supplied as CHP ready as it may be possible to recover heat in the future should a commercially viable source for the supply of heat be identified. 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 for the units is an appropriate solution at this time.

5.1.8 Deeside Power (UK) Limited will carry out a periodic review of opportunities to utilise the waste heat from the development once the Environmental Permit variation is in completed.

Appendix 1 Drawings

DRAWING No.	C5682-GA-101	DO NOT SCALE	IF IN DOUBT ASK	REMOVE ALL SHARP EDGES	ALL DIMENSIONS IN mm UNLESS OTHERWISE STATED



CRAIG FOSTER ARCHITECTS

AREA SUBJECT OF APPLICATION FOR CERTIFICATE OF LAWFUL DEVELOPMENT

XXXXXX E
YYYYYY N — FLUE COORDINATES

FENCE

REV	AMENDMENT	BY.	CHK.	APR.	DATE.
PD	BUILDING LOCATION AMENDED	AB	SB	CF	07.02.25
PC	UPDATED FENCE POSITION AND ADDED GAS MAIN	EH	SB	CF	03.02.25
PB	UPDATED GA POSITION	EH	SB	CF	31.01.25
PA	ISSUE	EH	SB	CF	24.01.25

KEY TO FIRST LETTER OF DRAWING ISSUE.

'B' = AS-BUILT ISSUE
'A' = CONSTRUCTION ISSUE
'P' = PRELIMINARY ISSUE
'T' = TENDER ISSUE

FABRICATION/BUILD ONLY TO BE UNDERTAKEN AT CONSTRUCTION ISSUE

1:250 SCALE BAR

0 5 10 15 20 25 m

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TITLE	SITE GA
CLIENT	TRITON POWER
SITE	DEESIDE

PAPER SIZE.	A1	SCALE.	1:250	
DRAWN BY.	CRAIG FOSTER ARCHITECTS	DATE DRAWN.	29.11.2024	ISSUE.
DRAWING NO.	C5682-GA-101			PD

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Appendix 2 CHP-R Assessment Form: Requirement 1

#	Description	Units	Notes/Instructions
Requirement 1: Plant, Plant Location and Potential Heat Loads			
1.1	Plant Name		Deeside Power Station
1.2	Plant Description		The proposed plant is a gas-powered standby electricity generating facility which will participate in National Grids Short Term Operating Reserve (STOR) program. The plant consists of 11 no. 9.896 MWth containerised spark ignition engines utilising natural gas from the gas grid as the fuel source. Total net Rated Thermal Input = 108.856 MWth Total electrical Output = 49.478 MW
1.3	Plant Location (Postcode/Grid Ref)		Deeside Power Station Weighbridge Road Deeside Industrial Park Deeside Flintshire CH5 2UL The site is centred at National Grid Reference SJ 29703 71233.
1.4	Factors Influencing Selection of Plant Location		The site was primarily selected due to its proximity to a suitable gas grid connection and a technically and economically viable connection to the electricity network to export power. The land is also already under lease to the Operator for use as an electric generation facility and an environmental permit is in place for the facility. The site also contains suitable existing infrastructure, including transformers, which will be utilised by the new electric generation facility.
1.5	**Operation of Plant**		
a)	Proposed Operational Plant Load	%	100 (when operational)
b)	Thermal Input at proposed Operational Plant Load	MW	108.856
c)	Net Electrical Output at Proposed Operational Plant Load	MW	49.478

#	Description	Units	Notes/Instructions
Requirement 1: Plant, Plant Location and Potential Heat Loads			
d)	Net Electrical Efficiency at Proposed Operational Plant Load	%	45.4
e)	Maximum Plant Load	%	100
f)	Thermal Input at Maximum Plant Load	MW	108.856
g)	Net Electrical Output at maximum Plant Load	MW	49.478
h)	Net Electrical Efficiency at Maximum Plant Load	%	45.4
i)	Minimum Stable Plant Load	%	50
k)	Net Electrical Efficiency at Minimum Stable Plant Load	%	41.9
1.6	**Identified Potential Heat Loads**		
			No District Heating Networks or Large Heat Load Sites were identified within 10km of the Facility. Theoretical heat demand from the large industrial and domestic sectors was identified within 3km of the site. However, no suitable heat loads were identified for further assessment upon detailed analysis.

Appendix 3 Engine Technical Data Sheet

JENBACHER

Technical Description

Cogeneration Unit

JMS 624 GS-N.L

dyn. GC Profile 1 (150ms/30%)

Deeside 50MW Power Plant



Electrical output	4498	kW el.
Thermal output	2838	kW

Emission values

NOx < 250 mg/Nm³ (5% O2) | < 95 mg/Nm³ (15% O2)

JENBACHER

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Main dimensions and weights (at module) 4
Connections 4
Output / fuel consumption 4
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0.01 Technical Data (at module)

			100%	75%	50%
Power input	[2]	kW	9,896	7,607	5,304
Gas volume	*)	Nm³/h	1042	801	558
Mechanical output	[1]	kW	4,594	3,446	2,297
Electrical output	[4]	kW el.	4,498	3,367	2,223
Recoverable thermal output (calculated with Glycol 37%)					
~ Intercooler 1st stage	[9]	kW	1,688	1,037	491
~ Lube oil		kW	458	396	337
~ Jacket water		kW	692	604	511
~ exhaust when cooling down 351 °C -> 351 °C		kW	0	0	0
Total recoverable thermal output	[5]	kW	2,838	2,037	1,339
Total output generated		kW total	7,335	5,404	3,562
Heat to be dissipated (calculated with Glycol 37%)					
~ Intercooler 2nd stage		kW	---	---	---
~ Lube oil		kW	---	---	---
~ Surface heat	ca. [7]	kW	266	~	~
Spec. fuel consumption of engine electric	[2]	kWh/kWel.h	2.20	2.26	2.39
Spec. fuel consumption of engine	[2]	kWh/kWh	2.15	2.21	2.31
Lube oil consumption	ca. [3]	kg/h	0.92	~	~
Electrical efficiency			45.4%	44.3%	41.9%
Thermal efficiency			28.7%	26.8%	25.2%
Total efficiency	[6]		74.1%	71.0%	67.2%
Hot water circuit:					
Forward temperature		°C	80.0	72.1	65.2
Return temperature		°C	52.0	52.0	52.0
Hot water flow rate		m³/h	97.6	97.6	97.6
Fuel gas LHV		kWh/Nm³	9.5		

*) approximate value for pipework dimensioning
[ ] Explanations: see 0.10 - Technical parameters

All heat data is based on standard conditions according to attachment 0.10. Deviations from the standard conditions can result in a change of values within the heat balance and must be taken into consideration in the layout of the cooling circuit/equipment (intercooler; emergency cooling; ...).

Main dimensions and weights (at module)

Length	mm	~ 13,800
Width	mm	~ 2,500
Height	mm	~ 2,900
Weight empty	kg	~ 55,000
Weight filled	kg	~ 56,200

Connections

Hot water inlet and outlet [A/B]	DN/PN	100/16
Exhaust gas outlet [C]	DN/PN	600/10
Fuel Gas (at module) [D]	DN/PN	100/16
Water drain ISO 228	G	½"
Condensate drain	DN/PN	~
Safety valve - jacket water ISO 228 [G]	DN/PN	80/16
Safety valve - hot water	DN/PN	100/10
Lube oil replenishing (pipe) [I]	mm	28
Lube oil drain (pipe) [J]	mm	28
Jacket water - filling (flex pipe) [L]	mm	13
Intercooler water-Inlet/Outlet 1st stage	DN/PN	150/16
Intercooler water-Inlet/Outlet 2nd stage [M/N]	DN/PN	80/16

Output / fuel consumption

ISO standard fuel stop power ICFN	kW	4,594
Mean effe. press. at stand. power and nom. speed	bar	24.55
Fuel gas type		Natural gas
Based on methane number | Min. methane number	MZ	70 | 70 d)
Compression ratio	Epsilon	11.5
Min. fuel gas pressure for the pre chamber	bar	5.48
Min./Max. fuel gas pressure at inlet to gas train	bar	6 - 8 c)
Max. rate of gas pressure fluctuation	mbar/sec	10
Maximum Intercooler 2nd stage inlet water temperature	°C	52
Spec. fuel consumption of engine	kWh/kWh	2.15
Specific lube oil consumption	g/kWh	0.20
Max. Oil temperature	°C	~ 80
Jacket-water temperature max.	°C	~ 95
Filling capacity lube oil (refill)	lit	~ 1000

c) Lower gas pressures upon inquiry
d) based on methane number calculation software AVL 3.2 (calculated without N2 and CO2)

JENBACHER

0.02 Technical data of engine

Manufacturer		JENBACHER
Engine type		J 624 GS-K12
Working principle		4-Stroke
Configuration		V 60°
No. of cylinders		24
Bore	mm	190
Stroke	mm	220
Piston displacement	lit	149.70
Nominal speed	rpm	1,500
Mean piston speed	m/s	11.00
Length	mm	9,533
Width	mm	2,111
Height	mm	2,564
Weight dry	kg	17,100
Weight filled	kg	18,100
Moment of inertia	kgm²	92.70
Direction of rotation (from flywheel view)		left
Radio interference level to VDE 0875		N
Starter motor output	kW	20
Starter motor voltage	V	24

Thermal energy balance

Power input	kW	9,896
Intercooler	kW	1,688
Lube oil	kW	458
Jacket water	kW	692
exhaust when cooling down 180 °C	kW	1,248
exhaust when cooling down 100 °C	kW	1,818
Surface heat	kW	142

Exhaust gas data

Exhaust gas temperature at full load	[8]	°C	351
Exhaust gas temperature at bmep= 18.4 [bar]	[8]	°C	~ 386
Exhaust gas temperature at bmep= 12.3 [bar]	[8]	°C	~ 421
Exhaust gas mass flow rate, wet		kg/h	23,865
Exhaust gas mass flow rate, dry		kg/h	22,385
Exhaust gas volume, wet		Nm³/h	18,850
Exhaust gas volume, dry		Nm³/h	17,009
Max.admissible exhaust back pressure after y-pipe		mbar	50

Combustion air data

Combustion air mass flow rate	kg/h	23,150
Combustion air volume	Nm³/h	17,914
Max. admissible pressure drop at air-intake filter	mbar	10

basis for exhaust gas data: natural gas: 100% CH4; biogas 65% CH4, 35% CO2

Sound pressure level

Aggregate a)				dB(A) re 20µPa	103		
25	31,5	40	Hz	dB	87	83	84
50	63	80	Hz	dB	93	92	91
100	125	160	Hz	dB	95	97	101
200	250	315	Hz	dB	95	98	96
400	500	630	Hz	dB	92	91	90
800	1000	1250	Hz	dB	91	89	90
1600	2000	2500	Hz	dB	90	89	88
3150	4000	5000	Hz	dB	87	92	93
6300	8000	10000	Hz	dB	92	93	92
Exhaust gas b)				dB(A) re 20µPa	123		
25	31,5	40	Hz	dB	103	100	107
50	63	80	Hz	dB	107	98	108
100	125	160	Hz	dB	115	119	112
200	250	315	Hz	dB	112	112	107
400	500	630	Hz	dB	113	113	107
800	1000	1250	Hz	dB	109	108	108
1600	2000	2500	Hz	dB	108	108	109
3150	4000	5000	Hz	dB	117	117	102
6300	8000	10000	Hz	dB	101	97	91

Sound power level

Aggregate	dB(A) re 1pW	126
Measurement surface	m²	194
Exhaust gas	dB(A) re 1pW	131
Measurement surface	m²	6.28

a) average sound pressure level on measurement surface in a distance of 1m (converted to free field) according to DIN 45635 and ISO 3744, precision class 3.
b) average sound pressure level on measurement surface in a distance of 1m according to DIN 45635 and ISO 3744, precision class 2.
The spectra are valid for aggregates up to bmep=24 bar. (for higher bmep add safety margin of 1dB to all values per increase of 1 bar pressure).
Engine tolerance ± 3 dB

0.03 Technical data of generator

Manufacturer		TDPS(-0,9cap) e)
Type		TD125-F2UB e)
Type rating	kVA	5,900
Driving power	kW	4,594
Ratings at p.f. = 1,0	kW	4,498
Ratings at p.f. = 0.8	kW	4,470
Rated output at p.f. = 0.8	kVA	5,587
Rated reactive power at p.f. = 0.8	kVar	3,352
Rated current at p.f. = 0.8	A	215
Frequency	Hz	50
Voltage	kV	15
Speed	rpm	1,500
Permissible overspeed	rpm	1,800
Power factor (lagging - leading) (UN)		0,8 - 0,9
Efficiency at p.f. = 1,0		97.9%
Efficiency at p.f. = 0.8		97.3%
Moment of inertia	kgm²	460.00
Mass	kg	19,500
Radio interference level to EN 55011 Class A (EN 61000-6-4)		N
Cable outlet		left
Ik" Initial symmetrical short-circuit current	kA	1.34
Is Peak current	kA	3.40
Insulation class		F
Temperature (rise at driving power)		F
Maximum ambient temperature	°C	40

Reactance and time constants at rated output (saturated)

xd direct axis synchronous reactance	p.u.	1.425
xd' direct axis transient reactance	p.u.	0.237
xd" direct axis sub transient reactance	p.u.	0.175
x2 negative sequence reactance	p.u.	0.227
Td" sub transient reactance time constant	ms	40
Ta Time constant direct-current	ms	130
Tdo' open circuit field time constant	s	2.56

e) JENBACHER reserves the right to change the generator supplier and the generator type. The contractual data of the generator may thereby change slightly. The contractual produced electrical power will not change.

0.04 Technical data of heat recovery

General data - Hot water circuit		
Total recoverable thermal output	kW	2,838
Return temperature	°C	52.0
Forward temperature	°C	80.0
Hot water flow rate	m³/h	97.6
Nominal pressure of hot water	PN	10
min. operating pressure	bar	3.5
max. operating pressure	bar	9.0
Pressure drop hot water circuit	bar	1.70
Maximum Variation in return temperature	°C	+0/-5
Max. rate of return temperature fluctuation	°C/min	10

The final pressure drop will be given after final order clarification and must be taken from the P&ID order documentation.

JENBACHER

connection variant H2

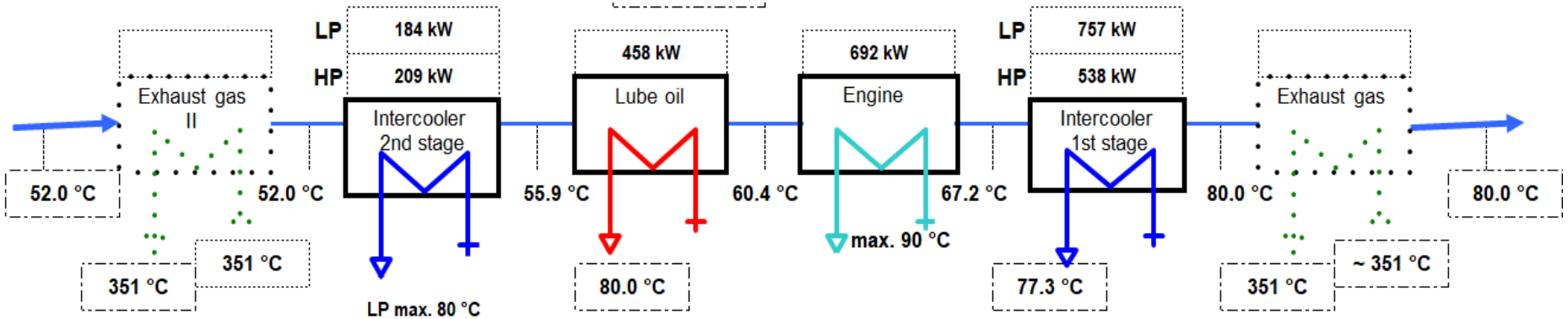
J 624 GS-K12

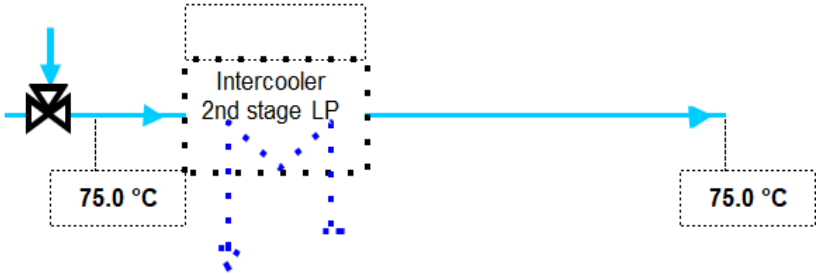
Hot water circuit (calculated with Glycol 37%)

Recoverable thermal output = **2,838 kW**

(+12/-8 % tolerance)

Hot water flow rate = **97.6 m³/h**



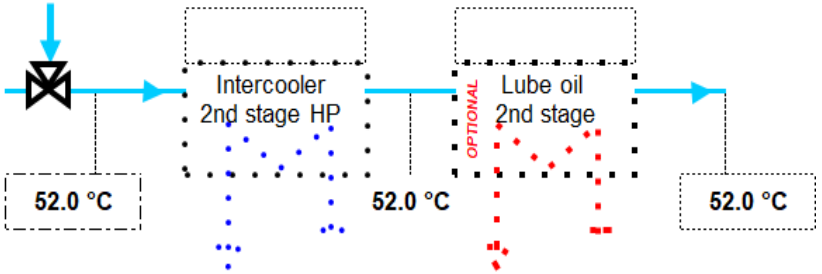


Low temperature circuit (calculated with Glycol 37%)

Heat to be dissipated = **0 kW**

(+12/-8 % tolerance)

Cooling water flow rate = **50.0 m³/h**



0.10 Technical parameters

All data in the technical specification are based on engine full load (unless stated otherwise) at specified temperatures and the methane number and subject to technical development and modifications.

All pressure indications are to be measured and read with pressure gauges (psi.g.).

[1] At nominal speed and standard reference conditions ICFN according to ISO 3046-1, respectively
[2] According to ISO 3046-1, respectively, with a tolerance of +**5** %.
Efficiency performance is based on a new unit (immediately upon commissioning).Effects of degradation during normal operation can be mitigated through regular service and maintenance work.

[3] Average value between oil change intervals according to maintenance schedule, without oil change amount
[4] At p. f. = 1.0 according to IEC 60034-1:2017 with relative tolerances, all direct driven pumps are included
[5] Total output with a tolerance of +12/-8 %
[6] According to above parameters [1] through [5]
[7] As a guiding value at p.f. 0.8 and only valid for (engine, generator, TCM). Other peripheral equipment is not considered.
[8] Exhaust temperature with a tolerance of ±8 %
Note: an optimised operating mode to minimise methane slip can result in changed exhaust gas data (exhaust gas temperature, NOx emissions, etc.) and must be taken into account in the design of the exhaust gas aftertreatment
[9] Mixture temperature at:
If the engine is designed for intake air temperatures of > 30°C, then the stated mixture heat of the 1st stage is to be increased from 25°C in 2%/°C increments. The additional temperature must be added to the resulting full load point.

Radio interference level
The ignition system of the gas engines complies the radio interference levels of CISPR 12 and EN 55011 class B, (30-75 MHz, 75-400 MHz, 400-1000 MHz) and (30-230 MHz, 230-1000 MHz), respectively.

Definition of output
- ISO-ICFN continuous rated power:
  Net break power that the engine manufacturer declares an engine is capable of delivering continuously, at stated speed, between the normal maintenance intervals and overhauls as required by the manufacturer. Power determined under the operating conditions of the manufacturer's test bench and adjusted to the standard reference conditions.
  - Standard reference conditions:

Barometric pressure:	1000 mbar (14.5 psi) or 100 m (328 ft) above sea level
Air temperature:	25°C (77°F) or 298 K
Relative humidity:	30 %

- Volume values at standard conditions (fuel gas, combustion air, exhaust gas)

Pressure:	1013 mbar (14.7 psi)
Temperature:	0°C (32°F) or 273 K

Loss of engine performance

a) Performance reduction due to gas quality

If the reference methane number is not reached and the knock control responds, the ignition timing at full performance is adjusted in conjunction with the engine management system; only then is performance reduced.

H2 admixtures in the range of 3–5 Vol% into the natural gas network are generally regarded as non-critical. Prerequisites for this are rates of change according to TA 1000-0300, as well as the knock resistance (minimum methane number) of the natural gas-H2 mixture according to the specification. For reliable compliance with required NOx emissions, the JENBACHER LEANOX^{plus} control is recommended (measurement of NOx emissions and correction of the LEANOX controller). Higher H2 addition rates into the natural gas network must be assessed on a project-specific basis.

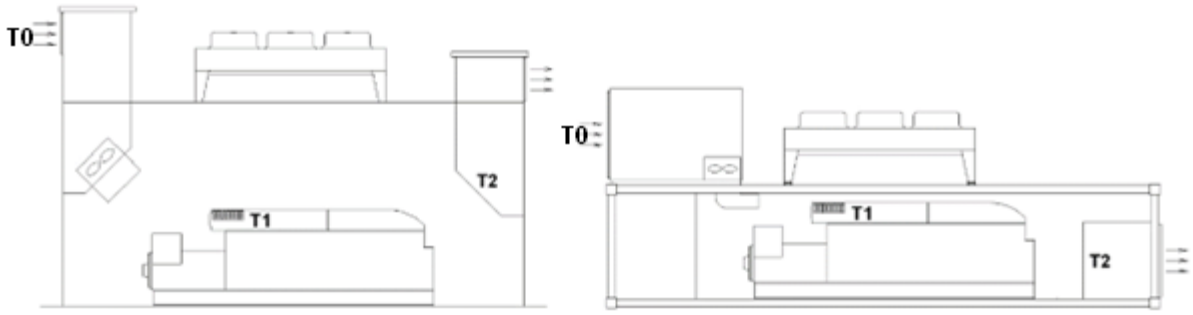
b) Performance reduction due to voltage and frequency limits

If the voltage and frequency limits for generators specified in IEC 60034-1 Zone A are exceeded, performance is reduced.

c) Performance reduction due to environmental conditions

Standard rating of the engines is for an installation at an altitude ≤ 500**m** and combustion air temperature ≤ 30**°C** (T1)

Engine room outlet temperature: **50°C** (T2) -> engine stop



The minimum recommended air change ratio (C) must be observed to maintain according to TA 2300-0030.

Parameters for the operation of JENBACHER gas engines

The genset fulfils the limits for mechanical vibrations according to ISO 8528-9.

The following forms an integral part of a contract and must be strictly observed: **TA 1000-0004, TA 1100 0110, TA 1100-0111, TA 1100-0112**, and **TA 2300-0030.**

Transport by rail should be avoided. See **TA 1000-0046** for further details

Failure to adhere to the requirements of the above-mentioned TA documents can lead to engine damage and may result in loss of warranty coverage.

The engine is tested on the test stand with a specific natural gas. The natural gas as used by the Seller on the test stand may differ from the gas as ultimately used by the Customer. For this reason, performance and efficiency levels, exhaust-gas temperatures, gas consumption, etc. may deviate from the parameters specified in the contract.

Ready for H2 means a possible adaptation up to 100vol% H2 operation. Performance data, timeline and costs can be determined on a project-specific basis.

Parameters for the operation of control unit and the electrical equipment

Relative humidity 50% by maximum temperature of 40°C.

Altitude up to 2000m above the sea level.

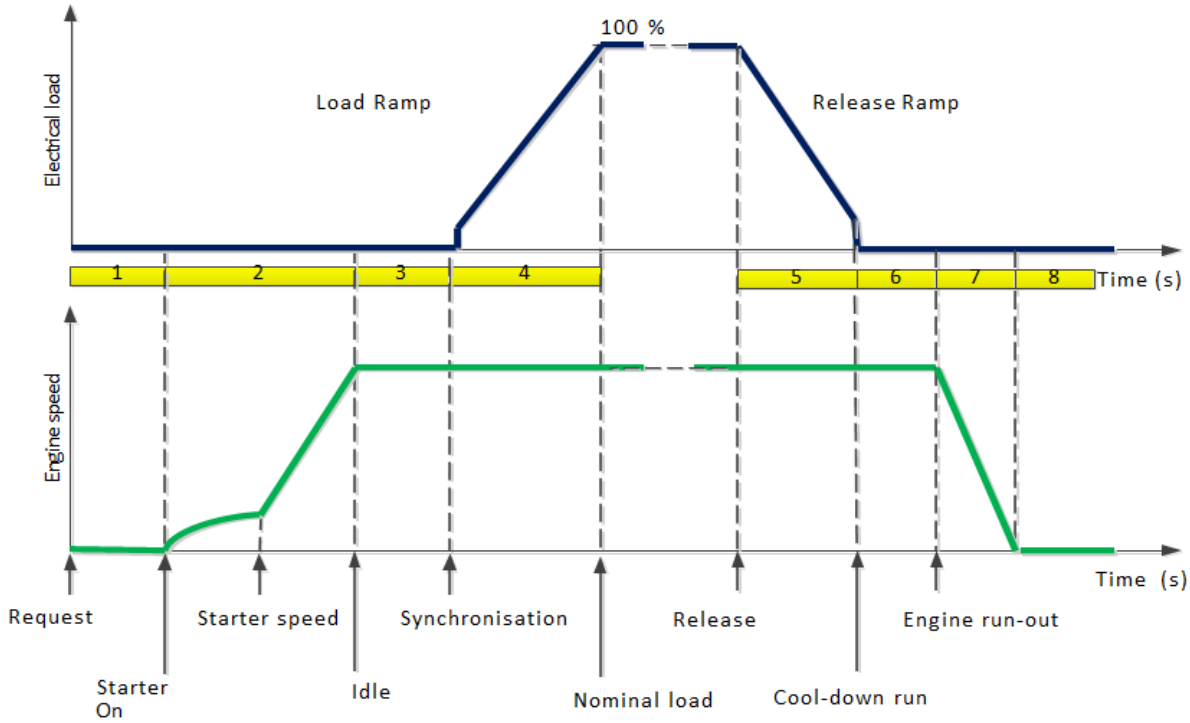
0.20 Mode of Operation

Grid Parallel Mode
The genset is running in parallel to the utility. The unit load can be adjusted via its power control set point or designated option.
Procedure in the event of mains failure:
When the mains monitor relay (protective relay ANSI No. 27, 59, 81, 78- provided either by JENBACHER or the customer) is activated due to a mains failure, the engine is isolated from the mains by opening the generator breaker. The module is shut down without any cool-down run.
Island operation is not available in this case!
The module can be restarted following the restoration of mains power after a 5-minute mains stabilization period.

0.20.01 Guide values for genset - start/stop times and el. load ramps

Basic boundary conditions for engine start:

Engine conditions	Oil temperature (°C / °F)	Cooling-water temperature (°C / °F)
Fast start release	> 27 / 80.6	> 55 / 131
Start enable automatic start		> 37 / 98.6
synchronization release		> 55 / 131



The following time data of the individual start sections up to the nominal load are **guideline values** for a fully automatic start under preheated conditions for mains parallel operation. Only the total start time is observed under the various engine conditions. The individual time periods specified in the table therefore do not necessarily add up to the specification of the total start time in mains parallel operation.

Deviations are possible for special designs.

	J208	Type 3	Type 4	Type 612 – 620	J624
(1) Start preparation [1] *)	0	0	20	70	90
(2) Engage starter until reaching nominal speed [s] *)	20	20	25	40	40
(3) Synchronisation [s] *) **)	1-50	1 – 50	1 – 50	1 – 50	1 – 50
(4) Load application up to nominal load [s] *) **)	180	180	180	160	160
Total start-up time from request to nominal load [s]	<300	<300	<300	<300	<330

*) The times for start-up preparation and synchronisation can vary greatly and depend on project specifications.
) Fast start function and faster load ramps are available on request.

The following **times for unloading the engine** are guide values for engine/generator combination inertia constant H<1 kWs/kVA (with LS, CGT, TDPS generators) and the hot operating condition.

	J208	Type 3	Type 4	Type 612 – 620	J624
(5) Load reduction ramp [s]	160	160	160	160	120
(6) Cool-down run [s]	60	60	60	10	10
(7) Run-down [s]	60	60	60	60	60
Total time from nominal load to run-down time [s]	280	280	280	220	180
(8A) gas tightness control [s]	<100	<100	<100	<100	<100
(8B) Flushing time exhaust tract after shutdown [s]***)				100	100
(8C) Flushing time exhaust tract after shutdown with SD and WT [s]***)				180	300
(8D) Flushing time exhaust tract after shutdown with SD, WT, SCR and greenhouse [s]***)				225	400
(8E) Blocking time for restart [s]	30	30	30	30	30

***) The exhaust gas purging times apply when the exhaust gas purging fan is installed

The table shows the waiting time between stopping the engine and starting it again, with the gas tightness check (8A), exhaust gas scavenging (8B-D) and blocking time (8E) being carried out in parallel. The flushing times can be extended project-specifically depending on the exhaust system.
It should also be noted that the exhaust gas purge must be performed after each unsuccessful start attempt once the gas valve has been opened. (SD = silencer, WT = heat exchanger)

0.30 General information for connection to the public mains

Technical Instruction TA 1530-0188 describes the - possibly optional - functions and parameters for complying with the boundary conditions defined in the country-specific "Grid Codes".

Network operator-dependent requirements must always be coordinated with JENBACHER.

0.30.10 Generator operating range in mains parallel operation

Frequency:
Normal operation fn +/-2% - without power output reduction
Extended operation: fn +4/-6%- with power output reduction between 2 – 10%/Hz
Frequency-measurement resolution: <= 10mHz (resolution)
Generator - voltage range: +/-10% of generator Un
Generator power factor cos phi at the generator terminals: as specified in "0.03 Generator technical data"

FRT (Fault Ride Through) – capability: at mains connection point
Profile 1: 150ms/30%Un (applies to natural gas and biogas)
Profile 2 (150ms/5%Un) and Profile 3 (250ms/5%Un) upon request.

Requirement:
- mains short-circuit power must be at least 5 x SrE or 50MVA
- FRT capability of the onsite auxiliaries

Extended project requirements and country-specific design are optionally possible after consultation and approval with JENBACHER.

0.30.20 Possible mains operator requests

To protect the generating unit in mains parallel operation, appropriate mains protection monitoring functions are necessary to disconnect the generator from the mains in case of a mains fault.

The mains operator-dependent specifications such as e.g.: voltage and frequency range, active power limitation, load ramps, reactive power limitation and control, protection concept, necessary certification or declarations, process data and interfaces are to be specified in project enquiries and must be agreed with JENBACHER before conclusion of the contract.

- Selectivity assessment, protection tests and recurring tests: on-site by the system operator
- Control power provision via pool operator: on request e.g., primary, secondary, tertiary
- Black start capability and countering in own use: on request
- Power generation system (EZA) controller or central control: on-site or possible on request
- Process data scope / remote control:
  - System data must be provided by the connectee for the mains operator.
  - Remote control interface to the mains operator: on-site
  - Interface specification!

Billing measurements - installation, operation, maintenance and remote data transmission: on-site.

Models of genset and generator: simplified models executed as effective value models for mains parallel operation optionally available.
Model formats: Powerfactory, or PSS/E (as of PP23)

Validated genset models in Powerfactory according to FGW TR3, TR4 and TR8 by a body accredited for this purpose according to DIN EN ISO/IEC 17065

Functional scope of the models in mains parallel operation:
- static voltage stability
- dynamic mains support
- Provision of reactive power
- Behaviour at active power setpoint
- Active power adjustment in the event of overfrequency and underfrequency (LFSM-O, LFSM-U)
- Protective devices and settings

0.30.20.01 Active power adjustment in the event of overfrequency and underfrequency

The following functions are available:
- LFSM-U: Limited Frequency Sensitive Mode - Underfrequency
- LFSM-O: Limited Frequency Sensitive Mode - Overfrequency
- FSM

Reduced power output at overfrequency: (LFSM-O function)
The frequency threshold is freely adjustable from fn + (200 - 500mHz) and the static from 2% to 12%. Unless the relevant mains operator specifies otherwise for the LFSM-O mode, a threshold of fn + 200mHz and a static of 5% is set.

Power increase in the event of underfrequency (LFSM-U function) – (OPTIONAL as of XT4.5)
activated according to the mains operator's specifications
The frequency-sensitive active power feed-in has the effect that the generating plant
also moves permanently up and down on the frequency characteristic curve ("driving on the characteristic curve") in the frequency range between fn - 200mHz (unless otherwise specified by the mains) and fn - 2.5Hz with regard to its maximum possible active power feed-in.
The prerequisite for this is a corresponding power setpoint.

Reduced power output at underfrequency:
below 98% of fn, reduction by standard 10% of maximum capacity per Hz. Reduction up to maximum fn - 6%.
Lower reduction ramps of 2 - 10%/Hz on request
The FSM function is available as an option

The power generation system is capable of continuing to operate at this minimum power when the minimum power for controllable operation is reached.

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Transport
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Traffic Monitoring, Audits and Analysis
Travel Plans and Management Plans

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Planning Applications and Appeals
Feasibility Studies & Development Appraisals
Design & Access Statements

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Noise and Vibration Assessments
Baseline and Compliance Monitoring
Acoustic Design and Management Plans

Arboriculture
Arboricultural Impact Assessments
Tree Surveys and Tree Constraints Plans
Tree and Woodland Management Plans

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Air Quality Assessments and Monitoring
Dust Assessment and Management Plans
Odour Assessment and Management Plans

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68 -72 Newton Road
Belfast
BT4 1GW

MANCHESTER
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77 Dale Street
Manchester
M1 2HG

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