Determination of an Application for an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2010

Decision document recording our decision-making process

The Permit Number is:	EPR/XP3936NS/A001
The Applicant / Operator is:	South Hook CHP Limited
The Installation is located at:	Dale Road, Herbrandston, Milford Haven, Pembrokeshire, SA73 3SU.
Consultation commences on:	27th March 2015
Consultation ends on:	30th April 2015

What this document is about

This is a draft decision document, which accompanies a draft permit.

It explains how we have considered the Applicant's Application, and why we have included the specific conditions in the draft permit we are proposing to issue to the Applicant. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our position. Unless the document explains otherwise, we have accepted the Applicant's proposals.

The document is in draft at this stage because we have yet to make a final decision. Before we make this decision we want to explain our thinking to the public and other interested parties, to give them a chance to understand that thinking and, if they wish, to make relevant representations to us. We will make our final decision only after carefully taking into account any relevant matter raised in the responses we receive. Our mind remains open at this stage: although we believe we have covered all the relevant issues and reached a reasonable conclusion, our ultimate decision could yet be affected by any information that is relevant to the issues we have to consider. However, unless we receive information that leads us to alter the conditions in the draft Permit, or to reject the Application altogether, we will issue the Permit in its current form.

In this document we frequently say “we have decided”. That gives the impression that our mind is already made up; but as we have explained above, we have not yet done so. The language we use enables this document to become the final decision document in due course with no more re-drafting than is absolutely necessary.

We try to explain our decision as accurately, comprehensively and plainly as possible. Achieving all three objectives is not always easy, and we would welcome any feedback as to how we might improve our decision documents in future. A lot of technical terms and acronyms are inevitable in a document of this nature: we provide a glossary of acronyms near the front of the document, for ease of reference.

Preliminary information and use of terms

We gave the application the reference number EPR/XP3936NS. We refer to the application as “the **Application**” in this document in order to be consistent.

The number we propose to give to the permit is EPR/XP3936NS. We refer to the proposed permit as “the **Permit**” in this document.

The Application was duly made on 12th November 2013.

The Applicant is South Hook CHP Limited. We refer to South Hook CHP Limited as “the **Applicant**” in this document. Where we are talking about what would happen after the Permit is granted (if that is our final decision), we call South Hook CHP Limited “the **Operator**”.

South Hook CHP Limited’s proposed facility is located at South Hook CHP Plant, Dale Road, Herbrandston, Milford Haven, Pembrokeshire, SA73 3SU. We refer to this as “the **Installation**” in this document.

How this document is structured

Glossary of acronyms used in this document

(Please note that this glossary is standard for our decision documents and therefore not all these acronyms are necessarily used in this document).

BAT	Best Available Technique(s)
BREF	BAT Reference Note
CCGT	Combined Cycle Gas Turbine
CEFAs	Centre for Environment, Fisheries and Aquaculture Science
CEM	Continuous emissions monitor
CHP	Combined heat and power
CROW	Countryside and rights of way Act 2000
CO	Carbon Monoxide
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DLN	Dry Low Nox
EA	Environment Agency
EAL	Environmental assessment level
ELV	Emission limit value
EU ELV	European Union Emission Limit Value
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2010 (SI 2010 No. 675) as amended
EQS	Environmental quality standard
GTG	Gas Turbine Generator
GWP	Global Warming Potential
HRSG	Heat Recovery Steam Generator
IED	Industrial Emissions Directive
IPPCD	Integrated Pollution Prevention and Control Directive (2008/1/EC)
LCPD	Large Combustion Plant Directive (2001/80/EC)
LNG	Liquefied Natural Gas
NOx	Oxides of nitrogen (NO plus NO_2 expressed as NO_2)
NRW	Natural Resources Wales
NTS	National Transmission System
Opra	Operator Performance Risk Appraisal
PC	Process Contribution
PEC	Predicted Environmental Concentration

PINs	Planning Inspectorate
PPS	Public participation statement
RGN	Regulatory Guidance Note
SAC	Special Area of Conservation
SCR	Selective catalytic reduction
SCV	Submerged Combustion Vaporiser
SGN	Sector guidance note
SNCR	Selective non-catalytic reduction
SPA(s)	Special Protection Area(s)
SSSI(s)	Site(s) of Special Scientific Interest
STG	Steam Turbine Generator

1 Our proposed decision

We are minded to grant the Permit to the Applicant. This will allow the permit holder to operate the Installation, subject to the conditions in the Permit.

We consider that, in reaching that decision, we have taken into account all relevant considerations and legal requirements and that the permit will ensure that a high level of protection is provided for the environment and human health.

The draft Permit contains many conditions taken from our Environmental Permit template including the relevant Annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the permit, we have considered the Application and accepted the details are sufficient and satisfactory to make the standard condition appropriate. This document does, however, provide an explanation of our use of "tailor-made" or installation-specific conditions, or where our Permit template provides two or more options.

2 How we reached our decision

The Application was duly made on 12th November 2013. This means we considered it was in the correct form and contained sufficient information for us to begin our determination but not that it necessarily contained all the information we would need to complete that determination.

The Applicant made no claim for commercial confidentiality. We have not received any information in relation to the Application that appears to be confidential in relation to any party.

We carried out consultation on the Application in accordance with the Environmental Permitting Regulations (EPR), our statutory Public Participation Statement (PPS) and our own Regulatory Guidance Series (RGS) Note 6 for Determinations involving Sites of High Public Interest. We consider that this process satisfies, and frequently goes beyond the requirements of the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, which are directly incorporated into the Industrial Emissions Directive (IED), which applies to the Installation and the Application. We have also taken into account our obligations under the Local Democracy, Economic Development and Construction Act 2009 (particularly Section 23). This requires us, where we consider it appropriate, to take such steps as we consider appropriate to secure the involvement of representatives of interested persons in the exercise of our functions, by providing them with information, consulting them or involving them in any other way. In this case, our consultation already satisfies the Act's requirements.

We advertised the Application by a notice placed on our website, which contained all the information required by the IED, including telling people where and when they could see a copy of the Application. We also placed an advertisement in the local newspaper, the Milford Mercury, on 29th November 2013.

We placed a paper copy of the Application and all other documents relevant to our determination (see below) on our Public Register held at Natural Resources Wales, Maes Newydd, Llandarcy, Port Talbot, SA10 6JQ and also sent a copy to the Pembrokeshire County Council, North Wing, County Hall, Freemans Way, Haverfordwest, Pembrokeshire, SA61 1TP for its own Public Register. Anyone wishing to see these documents could do so and arrange for copies to be made.

We sent copies of the Application to the following bodies:

- Pembrokeshire County Council Local Planning Department
- Pembrokeshire County Council Environment Protection Department
- Pembrokeshire Coast National Park Authority
- Welsh Government fisheries department
- Centre for Environment, Fisheries and Aquaculture Science
- Milford Haven Port Authority
- Food Standards Agency
- Health and Safety Executive
- National Grid
- South Hook LNG Terminal

These are bodies whose expertise, democratic accountability and/or local knowledge make it appropriate for us to seek their views directly.

In addition to our advertising the Application, we undertook a programme of extended public consultation from 29th November until 10th January 2014. Written comments were accepted by Natural Resources Wales beyond the formal consultation period. Further details along with a summary of consultation comments and our response to the representations we received can be found in Annex 4. We have taken all relevant representations into consideration in reaching our draft determination.

Although we were able to consider the Application duly made, we did in fact need more information in order to determine it, and issued an information notice on 21st February 2014. Copies of the information notices were placed on our public register.

Having carefully considered the Application and all other relevant information, we are now putting our draft decision before the public and other interested parties in the form of a draft Permit, together with this explanatory document. As a result of this stage in the process, the public has been provided with all the information that is relevant to our determination, including the original

Application and additional information obtained subsequently, and we have given the public two separate opportunities (including this one) to comment on the Application and its determination. Once again, we will consider all relevant representations we receive in response to this final consultation and will amend this explanatory document as appropriate to explain how we have done this, when we publish our final decision.

Finally we have consulted on our draft decision from 27th March 2015 to 30th April 2015. A summary of the consultation responses and how we have taken into account all relevant representations is shown in Annex 4B.

3 The legal framework

The Environmental Permitting Regulations 2010 and related Directives

The Permit will be granted, if appropriate, under Regulation 13 of the (Environmental Permitting Regulations) EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the Installation is:

- an installation for the purposes of the IED;
- subject to aspects of other relevant legislation which also have to be addressed.

We consider that, if we grant the Permit, it will ensure that the operation of the Installation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

We explain how we have addressed specific statutory requirements more fully in the rest of this document.

Carbon capture requirements

Although not included within the scope of this permit application, an area of just under 4 ha adjacent to the CHP Plant that has been reserved for possible future installation of carbon capture technology, if required. Should carbon capture technology be included within the proposals, this would be subject to a separate future variation application.

Directive 2003/35/EC – The Public Participation Directive

Regulation 59 of the EPR 2010 requires Natural Resources Wales to prepare and publish a statement of its policies for complying with its public participation duties. We have published our public participation statement.

This Application has been consulted upon in line with this statement, as well as with our guidance RGS6 on Sites of High Public Interest, which addresses specifically extended consultation arrangements for determinations where

public interest is particularly high. This satisfies the requirements of the Public Participation Directive.

Our decision in this case has been reached following a programme of extended public consultation, both on the original application and later, separately, on the draft permit and a draft decision document. The way in which this has been done is set out in Section 2. A summary of the responses received to our consultations and our consideration of them is set out in Annex 4.

National primary legislation

Environment Act 1995

(i) Section 4 (Pursuit of Sustainable Development)

We are required to contribute towards achieving sustainable development, as considered appropriate by Ministers and set out in guidance issued to us. In respect of regulation of industrial pollution through the EPR, the Guidance refers in particular to the objective of setting permit conditions "*in a consistent and proportionate fashion based on Best Available Techniques and taking into account all relevant matters…*" Natural Resources Wales considers that it has pursued the objectives set out in the Government's guidance, where relevant, and that there are no additional conditions that should be included in this Permit to take account of the Section 4 duty.

(ii) Section 7 (Pursuit of Conservation Objectives)

We considered whether we should impose any additional or different requirements in terms of our duty to have regard to the various conservation objectives set out in Section 9, but concluded that we should not.

We have considered the impact of the installation on local wildlife sites within 2Km which are not designated as either European Sites or SSSIs. We are satisfied that no additional conditions are required.

(iii) Section 81 (National Air Quality Strategy)

We have had regard to the National Air Quality Strategy and consider that our decision complies with the Strategy, and that no additional or different conditions are appropriate for this Permit.

Human Rights Act 1998

We have considered potential interference with rights addressed by the European Convention on Human Rights in reaching our decision and consider that our decision is compatible with our duties under the Human Rights Act 1998. In particular, we have considered the right to life (Article 2), the right to a fair trial (Article 6), the right to respect for private and family life (Article 8)

and the right to protection of property (Article 1, First Protocol). We do not believe that Convention rights are engaged in relation to this determination.

Countryside and Rights of Way Act 2000 (CROW 2000)

Section 85 of this Act imposes a duty on Natural Resources Wales to have regard to the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty (AONB).

Wildlife and Countryside Act 1981

Under section 28G of the Wildlife and Countryside Act 1981 Natural Resources Wales has a duty to take reasonable steps to further the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which a site is of special scientific interest.

We assessed the Application and concluded that the Installation will not damage the special features of any SSSI.

The CROW assessment is summarised in greater detail in section 9 of this document.

Natural Environment and Rural Communities Act 2006

Section 40 of this Act requires us to have regard, so far as is consistent with the proper exercise of our functions, to the purpose of conserving biodiversity. We have done so and consider that no different or additional conditions in the Permit are required.

National secondary legislation

The Conservation of Natural Habitats and Species Regulations 2010

We have assessed the Application in accordance with guidance and concluded that there will be no likely significant effect on any European Site.

The operation of the Installation would not have a likely significant effect on the interest features of protected sites.

The habitat assessment is summarised in greater detail in section 9 of this document. A copy of the full assessment can be found on the public register.

Water Framework Directive Regulations 2003

Consideration has been given to whether any additional requirements should be imposed in terms of Natural Resources Wales's duty under regulation 3 to secure the requirements of the Water Framework Directive through (inter alia) EP permits, but it is felt that existing conditions are sufficient in this regard and no other appropriate requirements have been identified.

Other relevant legal requirements

Duty to Involve

S23 of the Local Democracy, Economic Development and Construction Act 2009 require us where we consider it appropriate to take such steps as we consider appropriate to secure the involvement of interested persons in the exercise of our functions by providing them with information, consulting them or involving them in any other way. S24 requires us to have regard to any Secretary of State guidance as to how we should do that.

The way in which Natural Resources Wales has consulted with the public and other interested parties is set out in section 2 of this document. The way in which we have taken account of the representations we have received is set out in Annex 4. Our public consultation duties are also set out in the EP Regulations, and our statutory Public Participation Statement, which implement the requirements of the Public Participation Directive.

4 The Installation

Description of the Installation and general issues

The permitted activities

The application is being made by South Hook CHP Limited which is the legal entity that will be responsible for operating the CHP Plant. We are satisfied that the Applicant is the person who will have control over the operation of the Installation after the granting of the Permit and that the Applicant will be able to operate the Installation so as to comply with the conditions included in the Permit.

The Installation is subject to the EPR because it carries out an activity listed in Part 1 of Schedule 1 to the EPR:

- Section 1.1 Part A (1) (a) – burning any fuel in an appliance with a rated thermal input of 50 or more megawatts.

Many activities which would normally be categorised as "directly associated activities" (DAAs) for EPR purposes are included in the listed activity description.

We are satisfied that the Applicant's submitted OPRA profile is accurate. The OPRA score will be used as the basis for subsistence and other charging, in accordance with our Charging Scheme. OPRA is Natural Resources Wales's method of ensuring application and subsistence fees are appropriate and proportionate for the level of regulation required.

The Site

The CHP Plant is located within the existing Liquefied Natural Gas (LNG) Terminal site in Pembrokeshire Coast National Park, near Herbrandston, in the county of Pembrokeshire, Wales. The approximate National Grid Reference of the centre of the CHP Plant is SM 871 062. The existing elevation above sea level of the CHP Plant site is approximately 35-40 m AOD.

The Applicant submitted a plan which we consider is satisfactory, showing the site of the Installation and its extent. A plan is included in Schedule 7 of the Permit, and the Operator is required to carry out the permitted activities within the site boundary.

What the Installation does

The CHP Plant will burn natural gas only, supplied from the existing South Hook Liquefied Natural Gas Terminal (LNG Terminal) in a single Combined Cycle Gas Turbine (CCGT), to generate electricity and heat. There will be a back-up supply provided from the gas National Transmission System (NTS) if natural gas is not available from the LNG Terminal. Heat from the CHP Plant

steam turbine condenser system will be utilised within the LNG Terminal to re-gasify LNG, back into natural gas.

Natural gas from the LNG Terminal and/or the gas NTS will be supplied via separate gas supply lines (each including gas pressure reduction) to the CHP Plant, where the natural gas will be combusted in the gas turbine generator (GTG). Combustion air will be drawn in through an intake filter and then compressed and fed into the combustion chamber in which natural gas will be injected and ignited. The resulting hot combustion gases will pass through the turbine section of the GTG, driving the blades and rotating the shaft driving the compressor and the electrical generator to produce electricity. The electrical output from the GTG alone will be up to approximately 300 MWe.

Prior to the combusted gas being emitted to atmosphere via the stack, the surplus heat from the GTG combustion gases will be used to convert water to steam in the Heat Recovery Steam Generator (HRSG). The hot gases discharged from the GTG will enter the HRSG at a temperature of between 500°C and 600°C. Steam generated within the HRSG will be fed through the Steam Turbine Generator (STG) to generate additional electricity. Up to approximately 200 MWe of additional electricity will be produced by the STG in this way.

Steam exiting the STG will be condensed in the STG condenser system, and the condensate returned to the HRSG. The heat from the condenser system is used in the heat circuit of the LNG Terminal's SCVs to vaporise the LNG to Natural gas.

Modes of operation

The CHP Plant is designed to meet the LNG Terminal's demand for heat when the LNG Terminal is operating at up to 70% of its maximum gas send-out capacity. In this mode of operation there will be a reduction of approximately two thirds of the consented volumes (under the LNG Terminal Permit) to atmosphere from the LNG Terminal's Submerged Combustion Vaporiser (SCVs), approximately equivalent to the emissions from 10 SCVs. As well as being able to operate in integrated mode at varying levels of output, there are three further modes of operation in which each facility is capable of operating independently. These are:

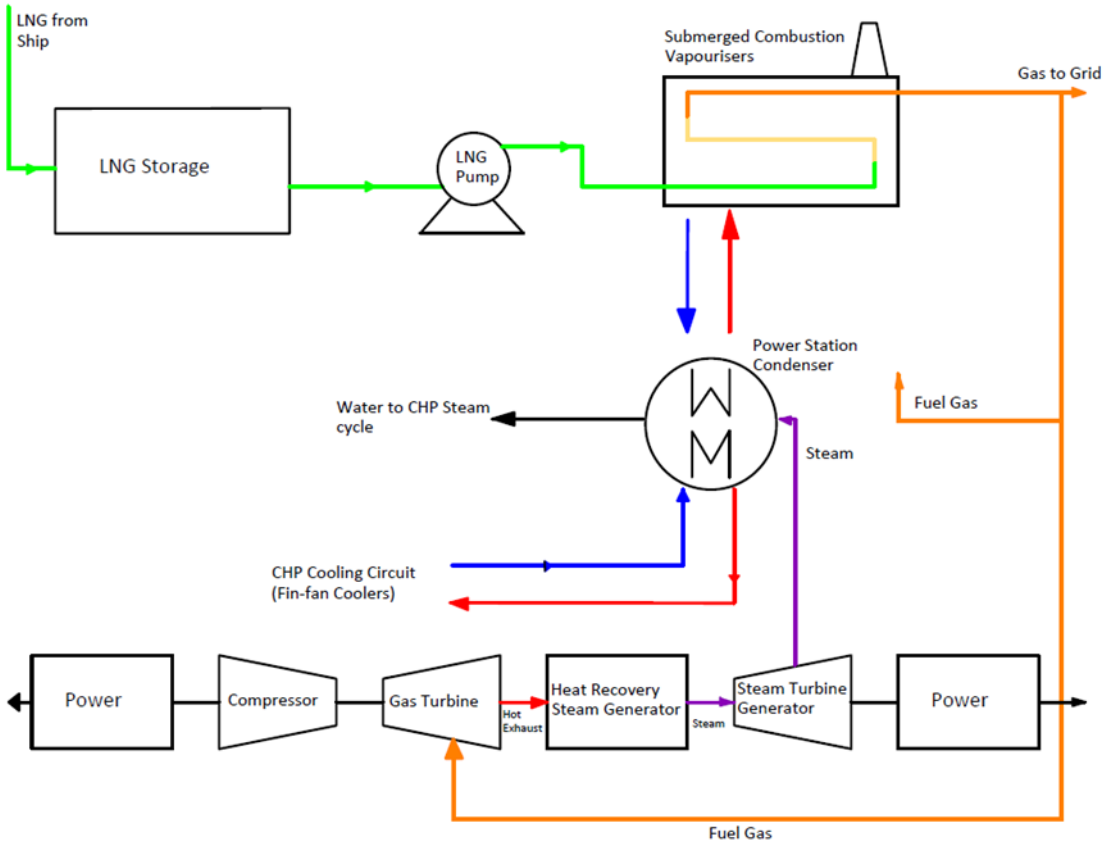
Integrated mode (i) – the CHP Plant operating with heat being provided to the LNG Terminal for LNG vaporisation;

Independent mode (ii) – the LNG Terminal operating as it currently does, without a heat supply from the CHP Plant (e.g. due to CHP Plant maintenance);

Independent mode (iii) – the CHP Plant operating but not providing all of its heat to the LNG Terminal due to lack of heat demand (e.g. due to the LNG Terminal having a low gas send-out demand and hence a low heat demand);

Independent mode (iv) – both the CHP Plant and the LNG Terminal operating with the requisite supply and demand of heat available, but without heat being provided to the LNG Terminal (e.g. due to the hot and return water lines between the CHP Plant and the LNG Terminal being unavailable as a result of maintenance during a period of high demand for gas and electricity).

Figure 1: Overview of process with CHP and LNG



Independent mode (iv) is very unlikely as this mode of operation is much less efficient than CHP and less efficient than CCGT operated with wet cooling which would be called to generate preferentially. An upper limit of operation in mode (iv) is expected to be less than 10%.

In each of the modes of operation there are a large number of combinations of the LNG Terminal operating below full capacity and the CHP Plant operating below full capacity and therefore below the maximum levels that are currently permitted. The CHP Plant is designed to operate and provide heat to the LNG Terminal for optimum efficiency and the CHP Plant will be able to provide all of the LNG Terminal's heat demand at gas send out rates below 70% of full LNG Terminal capacity with the CHP plant providing cooling requirements.

Combustion

The CHP Plant will utilise a dry low-NOX (DLN) combustion system to reduce peak flame temperature and minimise NOX formation (which is promoted by high temperature). This system is considered to represent BAT for NOX control. The combustion process will be closely monitored and optimised to minimise the formation of CO.

Nitrogen oxide emission concentrations from the CHP Plant are expected to be below 50 mg/Nm^3 referenced to dry conditions and 15 percent oxygen in the flue gas.

The combustion stage will be automatically controlled to ensure complete combustion, minimising carbon monoxide formation. The CHP Plant will have an ELV of 100 mg/Nm^3 for carbon monoxide referenced to dry conditions and 15 percent oxygen in the flue gas.

The use of the HRSG to generate steam for use in a steam turbine to provide additional power in a combined cycle (CCGT) is BAT.

Cooling options

The cooling mechanism for the CHP Plant condenser will vary depending on the LNG Terminal's operating modes when either cooling using exchange with the LNG Terminal's SCVs or standby CHP Plant cooling system operation.

Cooling using exchange with LNG Terminal (Integrated mode)

The CHP Plant has been designed to meet up to 70% of the maximum heat requirements of the LNG Terminal.

For integrated operation hot water from the CHP Plant's STG condenser system will be piped direct to the SCVs via a new pipeline (of nominal 56 inch diameter). This will be available to replace heat currently generated by the combustion of natural gas within the unmodified SCVs. The cooled water discharged from the SCVs will be returned to the CHP Plant in a closed loop system.

Cooling using standby cooling system

To accommodate periods when the LNG Terminal is not operating or is operating at a capacity which does not require all the available heat generated by the CHP Plant, the CHP Plant's dedicated condensate cooling system will be used.

A standby set of direct air-cooled fin-fan coolers with the capacity to allow the CHP Plant to operate at up to its full capacity independently of the LNG Terminal will be installed. In these structures the hot water discharge from the STG condenser system will be cooled within finned tubes by a flow of air drawn through by an array of fans.

The structure will be designed to allow flexibility of operation and permit the availability of cooling to be tailored to the operation of both the LNG Terminal and the CHP Plant by varying the number of cooling units in operation at any time, and installing two speed or variable speed fans.

This cooling system is a closed loop circuit which does not require the use of seawater as a coolant fluid and has no abstraction or discharge requirements.

As the key benefit of the CHP Plant is to utilise heat from the CHP Plant in the LNG Terminal, the CHP Plant will be designed to use its own cooling system at part load and to balance the LNG Terminal cooling demand. It is designed to be capable of full stand-alone operation, in case it is necessary to operate the CHP Plant when the LNG Terminal SCVs are unavailable or are operating at reduced Terminal throughput capacity as described above. The CHP Plant will have operational flexibility and be able to readily adapt to variations in the operation of both the CHP Plant and also the LNG Terminal.

The SCVs, when combusting natural gas to provide heat, can operate across a range of heat outputs whilst continuing to ensure compliance with air and water emission limits, which in turn allows the CHP Plant to vary the level of its electrical output. Depending on gas send-out volumes the LNG Terminal will set the desired flow of LNG to each SCV. This subsequently dictates the heat demand needed to reach the vaporisation rate for LNG entering each SCV.

When the SCVs are operating in natural gas firing mode the fuel flow to the burner is controlled to maintain the natural gas product temperature. When hot water is being supplied from the CHP Plant, the flow of hot water to each SCV will be controlled to maintain the SCV bath temperature. When both systems are operating the flow of heat from the CHP Plant to the SCVs will be maximised, with the balance of LNG Terminal export demand being provided by the direct burning of natural gas in the SCVs.

The amount of hot water flowing in the SCVs can vary greatly. The computerised control scheme will automatically send any hot water not used within the SCVs through a fluid cross exchanger with surplus heat sent, as required, to the direct air-cooled fin fan coolers. This will be accomplished using a control valve on the freshwater discharge header, which maintains the pressure in the SCV hot water supply header.

Emergency

An emergency diesel generator of approximately 500kWe capacity will be provided in order to supply electricity to the main CHP Plant auxiliaries, in the event of a complete electricity network black-out, to allow for safe shut down and to supply the administration office and control room. The emergency diesel generator will start immediately in the event of a black-out.

Efficient use of raw materials and storage

Water usage is predominantly associated with replenishing evaporative losses and boiler blow down in the combustion plant. Water consumption is estimated at 400,000 m^3/yr (50 m^3/hr) sourced from the local mains supply with some rain water harvesting. Welsh Water has advised the developer to contact them if it is intended to utilise potable water for industrial/commercial uses as constraints may arise.

The Applicant has set out in their application a range of measures to control water use which meet indicative BAT requirements.

Storage for all raw materials will be provided. Bulk storage tanks will be resistant to the material they are storing, have a bund (minimum volume of 110% of the capacity of the tank) and be fitted with a high level alarm for filling operations. Incompatible materials will not be stored together. Materials stored and used on site will be compliant with condition 1.3.1 and 3.2.3 of the permit.

Having considered the information submitted in the Application, we are satisfied that the appropriate measures will be in place to ensure the efficient use of raw materials and water.

Waste

Waste generation during the operation of the CHP Plant will be minimal, resulting mainly from maintenance activities. All wastes will be characterised prior to initial disposal to ensure that the proposed disposal route is appropriate. Information on the quantities of each waste stream removed from the site will be recorded in line with condition 1.4.1 of the permit.

Waste will be collected on site for disposal by licensed waste management contractors. All of the waste will eventually be incinerated, with the exception of the general, domestic and office wastes which will be recycled when possible, or go to a landfill. It is unlikely that waste oils will be produced in sufficient quantity to make recovery a suitable option, so these will be segregated and disposed of by a licensed waste management contractor.

We are satisfied that waste from the Installation that cannot be recovered will be disposed of using a method that minimises any impact on the environment. Standard condition 1.4.1 and 1.4.2 will ensure that this position is maintained.

Water

Water use will be minimised through the adoption of direct air-cooled fin-fan coolers as back-up rather than water-intensive cooling systems; closed loop systems (for exchange of hot water between the LNG Terminal and CHP Plant) and through good practice (reuse and return of condensates and control of boiler blow down rates). The net effect of the project will be to reduce discharges of process waste water to the Milford Haven Waterway for the CHP Plant and the LNG Terminal combined, when compared with the

current consented process waste water discharge from the LNG Terminal. The impact assessment for the discharges to the Milford Haven Waterway is detailed in section 8 of the decision document.

There will be no direct discharges to groundwater from the CHP Plant.

A new demineralised water plant will be installed to treat raw water for supply to the HRSG. The supply of demineralised water will top-up water lost due to boiler blow-down. Blow-down will be controlled to maintain boiler water quality while also minimising blow-down loss and consequent top-up. The demineralised water plant will also provide water to the hot water circulation system to the SCVs, to make up for losses due to evaporation.

Connections with South Hook LNG

A new pipeline will be installed to route the CHP Plant process waste waters from the process waste water treatment plant into the LNG Terminal process waste water effluent pipeline. The connection into the LNG Terminal's process waste water effluent pipeline will be downstream of the LNG Terminal's monitoring equipment. Monitoring equipment for the CHP Plant process waste water will be installed prior to the interconnection point.

The LNG Terminal receives, stores and vaporises LNG for ultimate supply to the gas NTS. The LNG Terminal has the capacity to process up to 15.6 million tonnes of LNG per year. Re-gasification of the LNG is currently achieved by operation of up to 15 SCVs, the number of SCV units operating at any given time being dependent on gas send-out requirements. Each SCV comprises a stainless steel tube bundle immersed in a warm water bath. The LNG flows through the tube bundle and is heated and vaporised by heat transferred from the water bath. The warm water temperature is maintained by supplying heat to the water in the SCVs through direct contact with hot gases resulting from the combustion of a small portion of the re-gasified LNG.

Due to condensation of water vapour from the combustion process, water accumulates in the SCVs and the surplus is currently discharged into the Milford Haven Waterway.

Modification of up to 15 existing SCVs and associated plant is required to enable heat recovered from the steam turbine condenser system of the CHP Plant to be used, with the remainder being able to continue to operate as installed, if required. The modifications to the SCVs will include internal modifications to the SCV bath to accommodate hot water circulation, installation of water mixers on the deck of each SCV, installation of hot water and return lines between the SCVs and the CHP Plant and construction of water sumps and return pumps.

The LNG Terminal's current electrical connection will be retained and reconfigured to permit switching between importing its electricity supply from the CHP Plant and the power connection and to provide a backup connection

for the LNG Terminal in the event that there is an outage of the new CHP Plant Grid connection.

There are a number of potential operating scenarios for the CHP Plant, from supplying the electrical demand and the majority of the heat demand of the LNG Terminal during periods of peak LNG Terminal operation to providing electricity to the Grid and the LNG Terminal during periods when the LNG Terminal is operating at low gas send-out rates. During these periods of peak LNG Terminal operation there will be a number of operational linkages which will need to be managed to ensure effective communication between the LNG Terminal and the CHP Plant and ensure both activities operate effectively as designed, in accordance with the requirements of their EP and in a safe manner. Pre operational condition 3 requires an overview of the EMS where these agreements will be incorporated with improvement condition 2 requiring the EMS to be implemented.

The following inter-relationships, will be managed between the LNG Terminal and CHP Plant:

1. The amount of gas to be supplied from the LNG Terminal to the CHP Plant; the discharge of process and surface waters from the CHP Plant to the LNG Terminal effluent pipeline.

2. The SCV heat demand and whether the heat is derived through SCVs using heat from the CHP Plant, or from the natural gas-fired SCVs, or a combination of the two.

3. Electricity delivery only to the Grid and other industrial sites in the vicinity of the Haven, to the LNG Terminal and Grid/other industrial sites in the vicinity of the Haven in conjunction, or just to the LNG Terminal.

4. Cooling using a heat exchange process with the LNG Terminal's SCVs, cooling using the direct air-cooled fin fan coolers, or a combination of the two.

Emissions to air

An air quality assessment has been undertaken and a determination of appropriate stack height has been carried out for the CHP Plant. Dispersion modelling results indicate that a stack height of 75 m should be selected for optimum dispersion of pollutants. Changes in pollutant concentrations associated with the operation of the CHP Plant at existing sensitive receptors are not significant, with slight improvements in pollution concentrations forecast for many receptor locations. The predicted lower concentrations is due to the improved dispersion from the taller CHP stack rather than the shorter individual SCV stacks. The reduced number of SCVs will operate when the CHP Plant is in integrated mode with the LNG Terminal.

Discharges to air will be monitored and reported by the CHP Plant using continuous emissions monitoring equipment supported by an annual stack test.
The nature of the process and materials used are not significantly odorous and no odour issues during the operational life of the facility are expected.

A detailed assessment of the air quality assessment can be found in section 7 of the decision document.

Noise

An assessment of noise and vibration effects has been carried out for the CHP Plant. The results of the assessment indicate that with proposed mitigation, noise levels from the CHP Plant will be appropriately controlled using best available techniques. There will be no significant vibration effects associated with the operation of the CHP Plant. The impact assessment of noise from the proposed installation is detailed in section 9.

Management

The Applicant has stated they will implement an Environmental Management System (EMS) that will be certified under ISO14001. Pre-operational condition (PO3) is included requiring the Operator to provide a summary of the EMS prior to commissioning of the plant and to make available for inspection all EMS documentation. NRW recognises that certification of the EMS cannot take place until the Installation is operational. An improvement condition (IC2) is included requiring the Operator to report progress towards gaining accreditation of its EMS.

We are satisfied that appropriate management systems and management structures will be in place for this Installation, and that sufficient resources are available to the Operator to ensure compliance with all the Permit conditions.

The CHP Plant propose to have in place a bespoke health, safety and environmental integrated management system aligned with the requirements of OHSAS 18001, ISO 9001 and ISO 14001 or equivalent international standards. The management system will incorporate environmental control procedures, which will be routinely audited to ensure compliance against the set expectations of the management system. These will be validated as part of the pre operational conditions and the improvement conditions.

Where relevant, operating procedures will include details of techniques to ensure that the CHP Plant is operated efficiently. Maintenance and housekeeping measures will be developed as part of the preventative maintenance system. This will include details of the measures specifically aimed at maintaining the efficiency of the facility during its operational life

The sites Integrated Management System (IMS) for operation of the CHP Plant will cover those elements required by the adopted environmental standard and the CHP Plant Permit. The Operator proposes to have in place

an Environmental Policy, which will form the framework for setting environmental objectives and targets. All staff and contractors will be made aware of the Environmental Policy and the Environmental Management System (EMS) requirements as part of their induction training. As part of the formal EMS, systems will be developed and implemented for undertaking audits, record keeping, setting and reporting of environmental performance, objectives, targets and programmes for future improvements.

Operational procedures will include monitoring procedures to ensure that key characteristics of the operations and activities that can have a significant impact on the environment are monitored on a regular basis, including any specific monitoring requirements set out in the EP, alongside associated requirements for recording of monitoring. Monitoring will include both emissions and plant operational performance that will form part of the permits requirements.

A preventative maintenance system will be established and implemented to ensure that all relevant plant is regularly maintained and serviced. Plant requiring preventative maintenance will include those items which are safety critical and also those items whose operation is critical to minimising the effect on the environment.

Records of maintenance shall include details of the service/maintenance, name of person/company performing the service/maintenance, results of the service/maintenance undertaken and/or equipment replaced and date of next required service/maintenance.

The Permit will be available for those with specific responsibilities for operating, monitoring, reporting and maintaining the CHP Plant in accordance with the EP requirements.

The computerised control systems of the LNG Terminal and the CHP Plant will regulate operations to take into account fluctuations in the demands and needs of both the CHP Plant and the LNG Terminal and to enable heat and/or electricity to be directed to where it is most needed. Equipment will be brought up to readiness and stood down from operation as and when required.

Suitably trained and experienced staff will oversee the operation of the CHP Plant, interfacing with the LNG Terminal to ensure efficient operation of each facility individually and collectively through agreed operational and communication systems, forming part of the management systems.

Accident management

The Applicant has submitted an Accident Management Plan. Having considered the Plan submitted in the Application, we are satisfied that appropriate measures will be in place to ensure that accidents that may cause pollution are prevented but that, if they should occur, their consequences are minimised. The Accident Management Plan will form part of the

Environmental Management System and will therefore need to be revised as part of the pre operational condition 3.

Site security

Having considered the information submitted in the Application, we are satisfied that appropriate infrastructure and procedures will be in place to ensure that the site remains secure.

Operating techniques

We have specified that the Applicant must operate the Installation in accordance with the following documents contained in the Application:

Table 1: Operating techniques

Description	Parts Included	Justification
Application	The response to Part B3 Section 3a of the application form – Technical Standards Chapter 2: Management of Activities Chapter 3: Operations Chapter 4: Emissions and monitoring Chapter 6: BAT Assessment	Information contains process control and design to ensure compliance with BAT and associated ELVs.
Schedule 5 Notice Request dated 21/03/14	Responses to the following questions: 1 to 4 with regard to operating scenarios 5 and 6 with regard to operating scenarios 11 to 20 with regard to noise impact and control	Information detailing the noise abatement achieved based on the final design with associated operating scenarios.

Key Issues in the Determination

The key issues arising during this determination were the impact on the Milford Haven Waterway and noise, we have, therefore, described how we determined these issues in most detail in this document.

5. Application of Best Available Techniques

In this section, we explain how we have determined whether the Applicant's proposals are the Best Available Techniques.

Should the Installation, once in operation, emit at rates significantly below the limits included in the Permit, we will consider tightening ELVs appropriately. We are, however, satisfied that emissions at the permitted limits would ensure a high level of protection for human health and the environment in any event.

BAT assessment

Cooling systems

The Integrated Pollution Prevention and Control (IPPC) Reference Document on the application of Best Available Techniques to Industrial Cooling Systems [viii] details a wide range of cooling options. The selection of a cooling system depends on the required cooling temperature, cooling capacity, the contamination risk (primary or secondary cooling loop) and the local setting, the latter two being of key importance here.

The cooling options considered were discussed in section 4 of the decision document. This section discusses the BAT assessment and compares against other alternative technologies that may be used.

Alternative technologies were considered for the standby cooling system and integration with the LNG Terminal, and these are discussed below. The options considered were:

- 'once-through' seawater cooling;
- hyperbolic natural draft cooling towers;
- air cooled condensers;
- mechanical draft wet closed-loop cooling system; and
- direct air-cooled fin-fan coolers.

A 'once-through' seawater cooling system was discounted because of the effect on the ecologically sensitive marine environment that could arise from the need to abstract and, in particular, discharge cooling water into the Waterway, a highly sensitive environment and part of the Pembrokeshire Marine SAC.

Similarly, due to the significant visible impact associated with hyperbolic natural draft cooling towers, that option was discounted.

The three other standby cooling options considered were taken forward at the Environmental Statement scoping stage and for the first phase of pre-Application consultation. Following further analysis and considering feedback from the public consultation, the 'dry' direct air-cooled fin-fan cooling option was selected. Public consultation, was not specifically in favour of any single option, but indicated that marine discharges should be avoided where possible.

The fin-fan solution is less efficient and larger in size than the two other remaining alternatives, air cooled condensers and mechanical draft wet closed-loop cooling system. Unlike those two remaining alternatives, however, the fin-fan solution has no marine discharges, requires no abstraction of water or additional use of chemicals and the noise level is lower than for the air-

cooled condensers, although slightly higher than for the wet closed-loop system. It is an important consideration in this context that the standby cooling system under consideration is not the primary cooling solution, which is provided by the LNG Terminal.

Given the high sensitivity of the Waterway, avoidance of impacts from the standby cooling option on this receiving environment is considered to be a high priority. Air cooling has lower maintenance cost and can be more flexible in process operation with opportunities to optimise fan performance to the cooling duty by variable pitch and speed fans. On this basis the fin-fan cooling option has been selected and is considered BAT for the provision of standby cooling at the CHP Plant.

Emissions to air

Continuous emissions monitoring devices shall comply with the relevant provisions of BS EN 14181. All installed monitoring equipment and systems will be certified under the Monitoring Certification Scheme (MCERTS) where such certified equipment is available. An annual stack test will be undertaken by an MCERTS certified body to confirm the performance of the continuous emissions monitoring system. In accordance with Annex V of the IED

The inclusion of abatement using selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) is not necessary. Whilst both of these abatement technologies can provide further reductions in NOX emissions, the inclusion of these systems would require the use and storage of additional raw materials (ammonia solution or urea) and catalyst for SCR; additional energy input with effect on overall efficiency of the CHP Plant; waste catalyst (SCR only); potential for increase hazards from storage of ammonia; and potential for increased global warming potential associated with releases of nitrous oxide associated with urea systems. Further, and in particular in relation to SCR these abatement technologies would increase both capital and operating costs and are not justified. Given the high performance of the DLN technology proposed which minimises the generation at source through design, the installation and operation of additional secondary abatement is not considered necessary and is not considered BAT for the proposed CHP Plant.

The BAT objective for the reduction of CO emissions will be met by complete combustion. Good management of combustion within the gas turbines (including high performance monitoring, process control techniques and suitable maintenance regimes) will minimise the production of CO.

The European Union BAT Reference Document (BREF) [ix] states that the combustion of natural gas produces emissions of SO_2 and PM that are very low, well below 10 mg/Nm^3 and 5 mg/Nm^3 respectively, and therefore no additional control measures are appropriate. In this case the BAT objectives will be achieved by the use of natural gas as the fuel.

Therefore, generally, we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation subject to the detailed audit referred to below.

Design options

CCGT plant are considered to be BAT for gas turbine installations in the UK since they offer high net thermal efficiency with the latest designs achieving greater than 55% thermal efficiency (average through life) in combined cycle operation. Energy efficiency is discussed in more detail in section 5 of the decision document. All other BAT requirements are discussed in Table 16. NRW agree that the Applicant has addressed the relevant BAT and that the site is capable of achieving the associated requirements.

Table 16: Associated indicative Best Available Techniques

Indicative BAT for Energy Efficiency and a Summary of the relevant Measures in Place at the CHP Plant Indicative BAT	**CHP Plant Measures**
Steam Turbines	
Replace existing turbines with more efficient turbines.	The turbine chosen is the most efficient when considering the different load factors and operational requirements of the CHP Plant.
Increase cycle efficiency by measures such as reheating steam between stages, improving the vacuum on condensers and using very high, including supercritical, pressures to increase the working temperature difference and cycle efficiency.	Cycle efficiency will be increased by reheating steam between stages, improving the vacuum on condensers and using very high pressures to increase the working temperature difference and cycle efficiency.
Take steam from between stages or from a backpressure exhaust for use in, for example, process or building heating.	The steam is fed to a steam turbine to provide additional power in a combined cycle gas turbine (CCGT). The heat demand within the LNG Terminal will recover and utilise heat.
Gas Turbines	
In large installations, consider installing more than one smaller turbine to allow for more efficient load following.	As described above, installing more than one turbine would result in inefficiencies due to the higher parasitic load of the turbine and need to manage their outputs in combination against the facility demands; consequently a single turbine design has been selected which is flexible across a wide range of terminal operating conditions
Consider measures to improve the efficiency of the turbine: Increasing the combustion temperature, but balanced against increase NOX levels and amounts of excess air required Using concentric shafts to connect different stages of compression and expansion – this is common in aero derivative machines Intercooling between stages of air compression and reheating between stages of expansion.	The efficiency of the turbine has been improved by the implementation of all of these measures.
The exhaust from even the most efficient gas turbines contain large amounts of heat that should be recovered, and used for process or building heating (CHP), or steam may be fed to a steam turbine to provide additional power in a combined cycle (CCGT). Supplementary fuel may also be	This is the case for the CHP Plant which is a CCGT where the steam turbine is the primary consumer of heat from the gas turbine. Residual heat is used for re-gasification of LNG when the CHP Plant and LNG Terminal are operating in

fired in the heat recovery boiler to meet the heat demands. The design of the system needs to optimise the characteristics of the turbines and boiler to achieve the best overall performance.	integrated mode. Returning cooled water to the CHP plant is used as cooling water.
Store, handle and transport all waste streams to prevent the release of waste, dust, Volatile Organic Compounds (VOCs), leachate or odour.	Delivery vehicles will off-load using a sealed connection within a bunded area. All deliveries will be overseen by a trained member of staff who will ensure that there is sufficient capacity within the appropriate storage vessel for the delivery. The integrity of all liquid storage containers will be subject to routine checks as part of daily site inspections. Boiler chemicals will be located in a bunded area. An impermeable surface will underlay all chemical and oil storage areas. All removal of waste will take place using enclosed trailers or skips to minimise any potential releases. Good housekeeping procedures will be in place to ensure any unexpected spillage would be cleaned up immediately. Any litter detected outside of the CHP Plant buildings will be cleared up as soon as practicable. The nature of the materials used is not significantly odorous and therefore odour issues during the operational life of the facility are not expected.
Recycle materials back into the process whenever possible	Very low rates of waste will be generated during the operation of the CHP Plant. When it is possible, general, domestic and office wastes will be recycled.
Inform NRW, and the local authority, when standby fuel is used, and when you return to gas firing.	This does not apply to the CHP Plant, as there is no standby fuel. There is a back-up fuel supply from the gas NTS if there is none available from the LNG Terminal; however, the fuel used will be natural gas.
Control emissions of NOX by a combination of the following, as applicable: Combustion control systems Combustion temperature reduction Low NOX burners Over fire air Flue/exhaust gas recycling Reburn Selective catalytic reduction (SCR) Selective non-catalytic reduction (SNCR)	The CHP Plant will control emissions of NOX via the following methods: The automatic control system will be designed to regulate the combustion stage to achieve complete combustion, minimising CO formation. The CHP Plant will utilise a dry low-NOX (DLN) combustion system to reduce peak flame temperature and thus minimise NOX formation. Reasons for not including SCR or SNCR are detailed in Section 6.4.
Process water (e.g. wet scrubbing)	
Chemically treat, neutralise and settle the effluent from wet scrubbing before discharge.	Wet scrubbing is not included as part of the CHP Plant operation. However, process water will be treated in a process waste water treatment plant. This will include pH adjustment to neutralise the waste water, and settlement.
Discharge volumes for sea water scrubbing make most treatment impracticable. Since contaminants are likely to be present in very low concentrations, focus your effort on minimising mass releases where practicable.	Sea water scrubbing will not be included in the CHP Plant operation; however, the proposed design of the CCGT power plant will minimise process water effluents and their impact.
Cleaning liquids	

Neutralise or treat wash waters and cleaning-out solutions to produce an acceptable waste before discharge or disposal.	Treatment will include pH adjustment using acid and alkali dosing to neutralise the waste water, and settlement. No further treatment is considered required.
Boiler cleaning wastes require appropriate disposal.	All removal of waste will take place using enclosed containers or skips to minimise any potential release.
Site drainage including rainwater	
Use an efficient oil/water separation/interceptor system. Further treatment may be required to remove dissolved hydrocarbons.	Surface waters will ultimately flow via oil interceptors and attenuation pond into the Waterway.
Direct discharge to controlled waters will only be allowed where discharges will meet discharge requirements under all conditions.	A flow control mechanism (such as a hydrobrake) will be installed at the outfall of the Primary Basin to control discharges into the existing LNG Terminal drainage system outlet to the Waterway. A penstock valve (manual or automated) will also be located at the outfall to prevent the discharge of water in the event of an accidental fuel or chemical spillage or an emergency fire event. There will be a smaller secondary storage basin (the Secondary Basin) located adjacent to the Primary Basin. This will capture run-off that may be generated when the Primary Basin is isolated, as set out above, and will be served with its own flow control unit to control discharges into the existing LNG Terminal drainage system outlet to the Waterway. Provision of these design mitigation measures will ensure that the surface water discharges from the CHP Plant site via the existing LNG Terminal drainage system outlet to the Waterway are cumulatively no greater than at present. Hence, it will be ensured that direct discharges to controlled waters will only be allowed where discharges will meet discharge requirements under all conditions.
Waste water treatment	
On-site wastewater treatment plant effluent must meet discharge standards.	All effluents leaving the site will be within the limits prescribed by the NRW in the EP.
Thermal plumes	
In terms of the overall energy efficiency of an installation, the use of once-through systems is an appropriate measure. It may be acceptable to use water from a river or an estuary for once-through cooling, provided that: Fish can still migrate through the extended heat plume in the receiving water The cooling water intake minimises fish entrainment Heat load does not interfere with other users of the receiving surface water	A 'once-through' seawater cooling system was discounted as a stand by cooling system having regard to the potential effect on the ecologically sensitive marine environment that could arise from the need to abstract and, discharge cooling water into the Waterway. This is discussed further in Section 6.
Windbreaks should be created by natural terrain, banks of earth or planting of long grass and evergreen trees in open areas. This has aesthetic benefits and such vegetation is able to capture and absorb dust without suffering long-term harm.	There is no requirement for mitigation of dust impacts from the CHP Plant as no fugitive dust emissions are expected to occur during the operational phase of the CHP Plant (see Appendix C).

Hydro seeding should be used to rapidly establish vegetation on waste tips, slag heaps or other apparently infertile ground.	There will be no waste tips on site, all waste will be removed by licensed waste management contractors.
Where materials are delivered by sea and dust releases could be significant, use self-discharge vessels or enclosed continuous unloaders.	This does not apply to the CHP Plant as there will be no materials delivered by sea.
Minimise dust generated by grab-type ship unloaders by ensuring adequate moisture content of the material as delivered, minimising drop heights and using water sprays or atomised mist at the mouth of the ship unloader hopper.	This does not apply to the CHP Plant, as the operation of the CHP Plant will not involve the use of grab-type ship unloaders.
Intercept rainwater run-off from open areas, especially coal and raw materials stocking areas, and remove the suspended solids by settlement or other techniques. Where there are potentially vulnerable receptors, monitor the quality of the water discharged from the storage and blending areas.	As stated in Section 4.3, surface waters will ultimately flow via an oil interceptors and attenuation pond into the Waterway.
Plant used to pre-treat and store raw materials should be totally enclosed, with extraction and arrestment plant as appropriate, to prevent emissions to atmosphere.	Appropriate storage for all materials will be provided. Bulk storage tanks, vessels will be resistant to the material they are storing, have a bund (minimum volume of 110% of the capacity of the tank) and be fitted with a high level alarm for filling operations. Incompatible materials will not be stored together.
You should demonstrate that the potential risks of contamination of land by deposition of dust, leachate or run-off are not significant and that you can comply with the requirements of the Groundwater Directive.	The Environmental Risk Assessment (Appendix E) evaluates the risks of fugitive emissions and demonstrates that they are not significant. There will be no direct emissions to groundwater from the CHP Plant.
Emissions to air	
In compliance with the IED, the emission limit values shall be regarded as having been complied with if the evaluation of the measurement result indicates, for operating hours within a calendar year, that the following conditions have been met: No validated monthly average value exceeds the relevant emission limit values; No validated daily average value exceeds 110% of the relevant emission limit values; and 95% of all the validated hourly average values over the year do not exceed 200% of the relevant emission limit values.	This is the case for the CHP Plant.
You should process the readouts from continuous emission monitors using software that reports monitoring compliance, to enable direct comparison with the emission limit values specified in relevant European legislation and in this guidance.	All monitoring will be undertaken using continuous emissions monitoring devices which shall comply with the relevant provisions of BS EN 14181. All installed monitoring equipment and systems will be certified under EA's Monitoring Certification Scheme (MCERTS) where such certified equipment is available. Software will be analysed to provide relevant compliance statistics/reports.

In order to relate emission concentrations to mass releases, you will need to measure or otherwise determine the stack gas flow rate. In order to relate measurements to reference conditions, you will need to determine temperature and pressure. Determination of oxygen or water vapour content may also be required. All such measurements should be recorded.	This will be the case for the CHP Plant, as stated in Section 4.8.9.
Emissions to water and sewer	
For combustion plants co-incinerating waste and operating air pollution control equipment with an aqueous discharge, you should comply with Article 8 and Annexes III and IV of the Waste Incineration Directive (WID).	This is not applicable to the CHP Plant.

Meeting the requirements of IED

IED Article reference	IED requirement	Permit condition
38	Monitoring of air emissions in accordance with Ann V Pt 3	Sections 3.5 and 3.6
41(a)	Determination of start-up and shut-down periods	2.3.5 and Schedule 1 Table 1.5
Ann V Pt 1(1)	All emission limit values shall be calculated at a temperature of 273,15 K, a pressure of 101,3 kPa and after correction for the water vapour content of the waste gases and at a standardised O2 content of 6 % for solid fuels, 3 % for combustion plants, other than gas turbines and gas engines using liquid and gaseous fuels and 15 % for gas turbines and gas engines.	Schedule 6 - Interpretation
Ann V Pt 1(6(1))	Definition of natural gas	Schedule 6 - Interpretation
AnnV Pt 1 (6(2,3) GT efficiency	(i) gas turbines, used in combined heat and power systems having an overall efficiency greater than 75 %; (ii) gas turbines used in combined cycle plants having an annual average overall electrical efficiency greater than 55 %; For single cycle gas turbines not falling into any of the categories mentioned under note (2), but having an efficiency greater than 35 % – determined at ISO base load conditions – the emission limit value for NOx shall be 50xη/35 where η is the gas turbine efficiency at ISO base load conditions expressed as a percentage.	Introductory note specifies efficiency, and 2.3.2 refers to IED Compliance Protocol.(Not relevant for new LCP)

AnnV Pt 1&2 (6)	For gas turbines (including CCGT), the NOx and CO emission limit values set out in the table contained in this point apply only above 70 % load.	3.1.2 and Schedule 3, Table S3.1
AnnV Pt 3(1)	Continuous monitoring for >100MWth for SOx, Nox, Dust; CO for gas fired.	3.5 (air emissions), 3.6 (IED LCP)
AnnV Pt3(7)	CEMs, oxygen, temp, press & water vapour (unless dried)	3.5.1 and Schedule 3, Table S3.1
AnnV Part 3(8&9)	CEN standards, M1 guidance	3.6.4 and 3.6.5
AnnV Pt3(10)	Confidence intervals and validated data	3.6.7
39, AnnV Pt 4	Compliance with ELVs	3.1.2 and Schedule 3, Table S3.1

6. Energy efficiency

A combined-cycle system with co-generation of heat and power offers a high degree of energy efficiency, with a net thermal efficiency of up to 88% under conditions of maximum heat utilisation by the LNG Terminal. The CHP Plant will use a computerised control system in order to achieve a high performance across the full range of operating conditions.

Further energy efficiency measures incorporated in the design of the CHP Plant will include:

- Choice of a single turbine that is the most efficient considering the load factor of the CHP Plant;
- Physical design and operational measures such as an efficient maintenance regime, staff training on efficient energy use, effective pipework and flange insulation and design of the CHP Plant to avoid uncontrolled air ingress;
- A range of energy management techniques during operation, including optimised warm-up procedures, close monitoring and maintenance to compressed air and steam systems to reduce leaks, regular cleaning of heat transfer surfaces and filters, and switching off of equipment when not in use.

Table 2 provides a breakdown of expected energy consumed within the proposed CHP Plant by source, under integrated operation (i.e. assuming integrated operation).

Table 2: Energy consumption

Energy Source	Annual Energy Consumption	
	Delivered MWh	Primary MWh
Power Station Energy Demand		
Natural Gas	6,382,886	6,382,886
Electricity (from CHP – parasitic load)	74,145	82,337 [1]
Electricity (from grid – start-up+shutdown)	5,750 [2]	14,951
Power Station Energy Produced		
Electricity (exported)	3,699,173	-
Hot water to SCVs	1,974,504	-

Table 3 summarises the effect on efficiency and internal demand of the CHP Plant under both integrated and independent modes.

Table 3: Energy efficiency

Mode	Energy Efficiency and Demand	
	Net Efficiency (%)	Internal Electricity Demand (Parasitic load) (MW)
Integrated mode [1]	88.5 – 90.5	11 – 13
Standalone mode [2]	56.5 – 58.5	15 - 17

The Environment Agency (EA) H2 document [ii] states that CHP "*can save 20-30% of a site's primary energy and is therefore one of the most important energy saving technologies*". A combined cycle operation and co-generation of heat and power is, therefore, to be considered as the first option, i.e. whenever the local heat demand is great enough to warrant the construction of such a system. This is the case with regards the proposed SH CHP Plant.

The CHP Plant will use an advanced computerised control system in order to control operations and achieve a high performance across the thermal process with combustion conditions that help to reduce emissions.

The turbine chosen is the most efficient when considering the different load factors and operational requirements of the CHP Plant. Installing more than one turbine would result in inefficiencies due to the higher parasitic load of the turbine and need to manage their outputs in combination against the facility demands; consequently a single turbine design has been selected.

The efficiency of the turbine has been improved by:

- increasing the combustion temperature (taking into account the potential for increases in NOX); and
- concentric shafts have been used to connect different stages of compression and expansion
- Design and construction of the CHP Plant to avoid uncontrolled air ingress;

The primary reasons for selecting CCGT technology are summarised below:

- CCGT power plants are highly efficient and will result in lower emissions than coal fired plant , of NOX, CO, and CO_2 and negligible amounts of sulphur dioxide (SO_2) and particulate matter (PM);
- CCGT power plants are reliable, flexible and capable of generating a nominal 500 MWe at the proposed power plant;
- CCGT power plants are relatively low cost to construct;
- CCGT power plants require minimal land take and smaller structures than many other forms of power generation technology;

- Natural gas is a secure fuel supply that is readily available to the proposed power plant site; and
- CCGT power plants produce very low amounts of solid waste (no ash) in the combustion process.

A comparison of emissions from the various combustion processes (based on meeting the 'new plant' standards of the Large Combustion Plant Directive (LCPD) (Directive 2001/80/EC)) is shown in Table 4.

Table 4: Comparison of combustion processes

	Typical Efficiency (%)	NO_X Emissions (g/MWh)	SO_2 Emissions (g/MWh)	PM Emissions (g/MWh)	CO_2 Emissions (g/MWh)
Sub-Critical Coal Fired Power Plant	38	3834	3834	255	843
Oil Fired Power Plant	38	3681	2454	369	737
Coal Gasification with CCGT	48	996	21	27	767
Proposed CCGT*	56.5 – 58.5	861	Negligible	Negligible	389

The use of a combined gas and steam turbine equipment results in the highest efficiency of fuel usage and emit approximately half the quantity of CO_2 emissions compared to an existing (sub-critical) coal fired power plant.

Single- or multi-shaft CCGT configurations are available. A single-shaft configuration was chosen for the CHP Plant.

The single-shaft combined cycle configuration consists of one gas turbine, one steam turbine, one generator and one HRSG, with the gas turbine and steam turbine coupled to a common generator in a tandem arrangement. The single-shaft configuration performs well in base load and mid-range power generation applications.

The choice of single- or multi-shaft configuration was discussed with the manufacturers and it was a common view that, for a single gas turbine and steam turbine system, the single-shaft configuration is the preferred option due to a lower capital cost and standardised design resulting in simpler controls and operation compared to a multi-shaft installation. A multi-shaft arrangement would usually only be considered if there were special circumstances such as high volumes of steam extraction for CHP uses, very high levels of duct firing, or where the site constraints were such that a single-shaft unit would not fit.

The Operator is required to report energy usage and energy generated in conditions under condition 4.2. Condition 1.2 in any event requires the

Operator to report every 4 years on opportunities to further improve energy recovery and efficiency.

7. Emissions to air

Combustion gas released to air will be discharged from a single stack of 75 metres in height. The design and operation of the CHP Plant will minimise NOx emissions, primarily through control of the combustion temperature.

Flue gases discharged from the stack will be monitored by an on-line continuous emissions monitoring system (CEMS), comprising a sampling system, analyser unit, data logging and reporting. The gas components measured will be, as a minimum, those stipulated by current legislation. Other gas components will be monitored for the purposes of process control. The components monitored will include:

- NOx concentration;
- CO concentration;
- Moisture concentration;
- Temperature;
- Flow rate.

The following monitoring requirements have been incorporated into the permit through condition 3.5. Table 5 has the monitoring requirements required in the permit.

Table 5: Monitoring requirements

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Parameter**	**Source**	**Limit (including unit)-these limits do not apply during start up or shut down.**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A1 on site plan in Schedule 7	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	Gas turbine fired on natural gas	50 mg/m^3 70% to MCR[1]	Validated hourly average	Continuous	BS EN 14181
			ELV to be agreed on completion of PO4 70% to MCR[1]	Daily mean of validated hourly averages		
			ELV to be agreed on completion of PO4 for MSUL/MSDL to MCR[2]			
			ELV to be agreed on completion of PO4 70% to MCR[1]	Monthly mean of validated hourly averages		
	Carbon Monoxide		ELV to be agreed on completion of PO4[1] 70% to MCR[1]	Validated hourly averages		
			100 mg/m^3 70% to MCR[1]	Daily mean of validated hourly averages		
			ELV to be agreed on completion of PO4 for MSUL/MSDL to MCR[2]			
			ELV to be agreed on completion of PO4 70% to MCR[1]	Monthly mean of validated hourly averages		
	Oxygen		-	-	Continuous as appropriate to reference	Traceable to national standards
	Water vapour		-	-		
	Stack gas temperature		-	-		
	Stack gas pressure		-	-		
	Flue gas homogeneity test		-	-	Pre-operation and when there is a significant operational change	BS EN 15259

A detailed air dispersion modelling exercise has been undertaken to examine the likely significance of environmental effects of emissions to air from the CHP Plant. The predicted air quality effects at sensitive receptors were all below the relevant air quality objectives, and it was concluded that no further mitigation measures are deemed necessary

The quantitative assessment includes consideration of two main scenarios:

Scenario 1: Current scenario of the existing 15 SCVs; and

Scenario 2: Operation of the CHP Plant plus 7 SCVs

Scenario 1 represents the worst-case scenario for the existing combustion plant. Scenario 2 represents the worst-case scenario under integrated operating conditions, as a maximum of 7 SCVs would be used when heat from the CHP Plant was being used to re-gasify the LNG. In addition to these scenarios, an assessment of emissions to air during stand-alone independent operations was also undertaken: this represents the operation of the CHP Plant plus LNG Terminal with 15 operating SCVs. All of these scenarios assumed that all relevant plant were operating continuously at 100% load, which is a very conservative assumption.

H1 assessment

A methodology for risk assessment of point source emissions to air, which we use to assess the risk of applications we receive for permits, is set out in our Horizontal Guidance Note H1 and has the following steps:

- Describe emissions and receptors
- Calculate process contributions
- Screen out insignificant emissions that do not warrant further investigation
- Decide if detailed air modelling is needed
- Assess emissions against relevant standards
- Summarise the effects of your emissions

The H1 methodology uses a concept of “process contribution (PC)”, which is the estimated concentration of emitted substances after dispersion into the receiving environmental media at the point where the magnitude of the concentration is greatest. The guidance provides a simple method of calculating PC primarily for screening purposes and for estimating process contributions where environmental consequences are relatively low. It is based on using dispersion factors. These factors assume worst case dispersion conditions with no allowance made for thermal or momentum plume rise and so the process contributions calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of process contributions can be achieved by mathematical dispersion models, which take into account relevant parameters of the release and surrounding conditions, including local meteorology – these techniques are expensive but normally lead to a lower prediction of PC. The Applicant has the choice to use either method.

Screen Out Insignificant Emissions

Once short-term and long-term PCs have been calculated (either by dispersion factors or modelling), they are compared with Environmental Quality Standards (EQS) referred to as “benchmarks” in the H1 Guidance.

Where a European Union Limit Value (EU LV) exists, the relevant standard is the Limit Value. Where an EU LV does not exist, our guidance sets out a National EQS (also referred to as Environmental Assessment Level - EAL) which has been derived to provide a similar level of protection to Human Health and the Environment as the EU LV levels.

PCs are considered **Insignificant** if:

- the **long-term** process contribution is less than **1%** of the relevant EQS; and
- the **short-term** process contribution is less than **10%** of the relevant EQS.

The **long term** 1% process contribution insignificance threshold is based on the judgements that:

- It is unlikely that an emission at this level will make a significant contribution to air quality;
- The threshold provides a substantial safety margin to protect health and the environment.

The **short term** 10% process contribution insignificance threshold is based on the judgements that:

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions;
- the proposed threshold provides a substantial safety margin to protect health and the environment.

Decide whether detailed modelling is needed

Where an emission cannot be screened out as insignificant as a PC through applying the first stage of our H1 Guidance, it does not mean it will necessarily be significant.

In these circumstances, the H1 Guidance justifies the need for detailed modelling of emissions, long-term, short-term or both, taking into account the state of the environment before the Installation operates, where:

- local receptors may be sensitive to emissions;
- released substances fall under an Air Quality Management Plan;
- the long term Predicted Environmental Concentration (PEC) exceeds 70% of the appropriate long term standard, (where the PEC is equal to the sum of the background concentration in the absence of the Installation and the process contribution);

- the short term Process Contribution exceeds 20% of the headroom, (where the headroom is the appropriate short term standard minus twice the long term background concentration).

Applying the Guidance to the Application

We reviewed the Applicant's detailed impact assessment to confirm whether or not we agree with the Applicant's conclusions with respect to H1 screening against the above criteria.

For those pollutants where the $PEC_{long\ term}$ exceeds 70% of an EAL/EU LV or the $PC_{short\ term}$ exceeds 20% of the headroom between an EAL/EU LV and the background concentration, we determine whether exceedences of EAL/EU LV are likely. This is done through detailed audit and review of the Applicant's impact assessment taking headroom and modelling uncertainties into account. Where an exceedence of an EAL/EU LV is identified, we may require the Applicant to go beyond what would normally be considered BAT for the Installation or refuse the application. Whether or not exceedences are considered likely, the application is subject to the requirement to operate in accordance with BAT.

National EALs do not have the same legal status as EU LVs, and there is no explicit requirement to impose stricter conditions than BAT in order to comply with a national EQS. However, national EALs are a standard for harm and any significant contribution to a breach is likely to be unacceptable.

This is not the end of the risk assessment, because we also take into account local factors (for example, particularly sensitive receptors nearby such as a SSSIs, SACs or SPAs). These additional factors may also lead us to include more stringent conditions than BAT.

If, as a result of reviewing of the risk assessment and taking account of any additional techniques that could be applied to limit emissions, we consider that emissions would cause significant pollution, we would refuse the Application.

In this Application, the Applicant has carried out detailed air dispersion modelling. We are satisfied that the model proposed reflects the likely impact of the emissions from the activity. We have applied the H1 criteria above to the model outputs, and this is described in the following sections.

Detailed assessment

NRW have undertaken checks using air dispersion modelling software Breeze Aermod version 7. NRW have used observed meteorological data from Milford Haven, years 1995-1997, in addition to Numerical Weather Prediction data for the years 2008 and 2009. NRW have carefully scrutinised the Applicant's proposals to ensure that they are applying the Best Available Techniques to prevent and minimise emissions of these substances. This is reported in section 5 of this document. The consultant has used air dispersion modelling

software Breeze Aermod version 7. Observed meteorological data from Milford Haven, years 2007-2011 has been used in their modelling.

Human Health Impact

NRW has a statutory role to protect the environment and human health from all processes and activities it regulates.

Industrial activities can give rise to odour, noise and vibration, accidents, fugitive emissions to air and water, releases to air, discharges to ground or groundwater, global warming potential and generation of waste. For an installation of this kind, the principal environmental effects are through emissions to air, although we also consider all of the other impacts listed. The use of H1 explains how we have approached the critical issue of assessing the likely impact of the emissions to air from the Installation on human health and the environment and any measures we are requiring to ensure a high level of protection.

NRW agree with the applicant that it is unlikely there will be any exceedence of air quality standards for NO_2 and CO at human receptors and that predicted pollutant concentrations due to the proposed CHP and 7 SCVs are likely to be less than those predicted for the existing maximum consented limit of 15 SCVs.

The applicant has demonstrated that there is likely to be a reduction in predicted pollutant concentrations due to the proposed installation when compared with the predicted concentrations of the existing operations at the maximum consented limit.

The applicant has applied conversion rates of NO_X to NO_2 of 70% and 35% for long and short term respectively. The modelling also included the effects of terrain within their modelling study.

Background levels for NO_2 were obtained from the 2010 annual diffusion tube measurement at South Hook LNG. Table 6 has the sensitive receptors considered as part of the risk assessment with Tables 7, 8 and 9 the predictions from the modelling.

Sensitive receptor locations include: residential properties, schools, hospitals and care homes, hotels, gardens of residential properties and any location outside or not fully enclosed where members of the public might reasonably spend one hour or longer (e.g. the Coastal Path). The Directive 2008/50/EC of the European Parliament and the Council of 21st May 2008 on ambient air quality and cleaner air for Europe (CAFE Directive) states in Annex III A:

Compliance with the limit value directed as the protection of human health shall not be assessed at the following locations:

(a) any locations situated within areas where members of the public do not have access and there is no fixed habitation;

(b) in accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply

(c) on the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access to the central reservation

Table 6: Sensitive receptors considered in assessment

Receptor Location ID	Grid Reference		Distance and direction from CHP Plant Stack	Description	Receptor type
	X	Y			
1	186978	207315	1140 m, N	Residential property	Residential
2	187024	207568	1380 m, N	Residential property	Residential
3	187291	207768	1590 m, N	Residential property	Residential
4	187805	207766	1710 m, NE	Residential property	Residential
5	188623	207279	1840 m, NE	Residential property	Residential
6	188479	206747	1450 m, NE	Residential property	Residential
7	188666	206233	1530 m, E	Residential property	Residential
8	188314	205744	1260 m, SE	Residential property	Residential
9	188202	205503	1270 m, SE	Residential property	Residential
10	188666	206179	1530 m, E	Point in Milford Haven	Residential
11	188911	206071	1780 m, E	Point in Milford Haven	Residential
12	189454	206194	2320 m, E	Point in Milford Haven	Residential
13	189196	205849	2090 m, E	Point in Milford Haven	Residential
14	189291	206411	2170 m, E	Point in Milford Haven	Residential
15	187991	206797	1050 m, NE	On golf course	Recreational
16	188262	206553	1180 m, NE	On golf course	Recreational
17	188428	206189	1290 m, E	On golf course	Recreational
18	188214	205984	1100 m, E	On golf course	Recreational
19	187981	205746	960 m, SE	On golf course	Recreational
20	188400	205820	1320 m, SE	On golf course	Recreational
21	187430	205460	790 m, SE	On Coastal Path	Recreational
22	186790	206210	350 m, W	On Coastal Path	Recreational
23	186500	206430	680 m, NW	On Coastal Path	Recreational
24	186800	205740	560 m, SW	On Coastal Path	Recreational
25	186810	206190	320 m, W	On Coastal Path	Recreational
26	186350	206790	990 m, NW	On Coastal Path	Recreational
27	185660	207360	1880 m, NW	On Coastal Path	Recreational

Table 7: Annual Mean NO_2 predictions

Receptor	AQO ($\mu g.m^{-3}$)	AC ($\mu g.m^{-3}$)	PC – Existing 15 SCVs ($\mu g.m^{-3}$)	PC – CHP + 7 SCVs ($\mu g.m^{-3}$)	PEC – Existing 15 SCVs ($\mu g.m^{-3}$)	PEC – CHP + 7 SCVs ($\mu g.m^{-3}$)	PC/AQO – CHP + 7 SCVs (%)	PEC/AQO – CHP + 7 SCVs (%)
1	40	10.4	1.83	1.09	12.2	11.5	2.7%	28.7%
2			1.56	0.97	12.0	11.4	2.4%	28.4%
3			1.51	1.01	11.9	11.4	2.5%	28.5%
4			2.11	1.37	12.5	11.8	3.4%	29.4%
5			2.21	1.38	12.6	11.8	3.4%	29.4%
6			4.40	2.82	14.8	13.2	7.1%	33.1%
7			3.93	2.11	14.3	12.5	5.3%	31.3%
8			3.77	1.63	14.2	12.0	4.1%	30.1%
9			3.30	1.52	13.7	11.9	3.8%	29.8%
10			3.83	2.05	14.2	12.5	5.1%	31.1%
11			2.89	1.60	13.3	12.0	4.0%	30.0%
12			2.03	1.18	12.4	11.6	3.0%	29.0%
13			2.02	1.13	12.4	11.5	2.8%	28.8%
14			2.49	1.42	12.9	11.8	3.6%	29.6%

Table 8: 99.79th Percentile 1 Hour Mean NO_2 predictions

Receptor	AQO ($\mu g.m^{-3}$)	AC ($\mu g.m^{-3}$)	PC – Existing 15 SCVs ($\mu g.m^{-3}$)	PC – CHP + 7 SCVs ($\mu g.m^{-3}$)	PEC – Existing 15 SCVs ($\mu g.m^{-3}$)	PEC – CHP + 7 SCVs ($\mu g.m^{-3}$)	PC/AQO – CHP + 7 SCVs (%)	PEC/AQO – CHP + 7 SCVs (%)
1	200	20.8	44.5	22.2	65.3	43.0	11.1%	21.5%
2			39.9	19.4	60.7	40.2	9.7%	20.1%
3			38.5	19.0	59.3	39.8	9.5%	19.9%
4			51.8	25.8	72.6	46.6	12.9%	23.3%
5			39.2	25.9	60.0	46.7	12.9%	23.3%
6			42.7	29.9	63.5	50.7	15.0%	25.4%
7			40.6	19.1	61.4	39.9	9.5%	19.9%
8			41.3	21.1	62.1	41.9	10.6%	21.0%
9			42.7	20.6	63.5	41.4	10.3%	20.7%
10			39.6	18.6	60.4	39.4	9.3%	19.7%
11			39.6	18.0	60.4	38.8	9.0%	19.4%
12			27.3	13.9	48.1	34.7	6.9%	17.3%
13			28.8	15.2	49.6	36.0	7.6%	18.0%
14			32.2	15.4	53.0	36.2	7.7%	18.1%
15			53.2	38.5	74.0	59.3	19.3%	29.7%

Receptor	AQO ($\mu g.m^{-3}$)	AC ($\mu g.m^{-3}$)	PC – Existing 15 SCVs ($\mu g.m^{-3}$)	PC – CHP + 7 SCVs ($\mu g.m^{-3}$)	PEC – Existing 15 SCVs ($\mu g.m^{-3}$)	PEC – CHP + 7 SCVs ($\mu g.m^{-3}$)	PC/AQO – CHP + 7 SCVs (%)	PEC/AQO – CHP + 7 SCVs (%)
16			48.0	29.6	68.8	50.4	14.8%	25.2%
17			44.5	21.7	65.3	42.5	10.9%	21.3%
18			51.1	24.5	71.9	45.3	12.3%	22.7%
19			50.8	27.6	71.6	48.4	13.8%	24.2%
20			39.6	20.9	60.4	41.7	10.5%	20.9%
21			44.5	19.1	65.3	39.9	9.6%	20.0%
22			151.9	116.6	172.7	137.4	58.3%	68.7%
23			134.8	99.8	155.6	120.6	49.9%	60.3%
24			99.4	34.4	120.2	55.2	17.2%	27.6%
25			157.5	118.3	178.3	139.1	59.2%	69.6%
26			82.3	71.4	103.1	92.2	35.7%	46.1%
27			43.4	28.5	64.2	49.3	14.2%	24.6%

Table 9: Maximum 8 Hour Mean CO predictions

Receptor	AQO ($\mu g.m^{-3}$)	AC ($\mu g.m^{-3}$)	PC – Existing 15 SCVs ($\mu g.m^{-3}$)	PC – CHP + 7 SCVs ($\mu g.m^{-3}$)	PEC – Existing 15 SCVs ($\mu g.m^{-3}$)	PEC – CHP + 7 SCVs ($\mu g.m^{-3}$)	PC/AQO – CHP + 7 SCVs (%)	PEC/AQO – CHP + 7 SCVs (%)
1	10,000	124	84.9	41.9	209	166	0.42%	1.7%
2			76.7	36.7	201	161	0.37%	1.6%
3			67.3	34.2	191	158	0.34%	1.6%
4			149.0	74.1	273	198	0.74%	2.0%
5			84.7	46.9	209	171	0.47%	1.7%
6			98.0	62.1	222	186	0.62%	1.9%
7			89.0	41.4	213	165	0.41%	1.7%
8			88.3	39.3	212	163	0.39%	1.6%
9			110.0	49.0	234	173	0.49%	1.7%
10			80.4	35.6	204	159	0.36%	1.6%
11			60.8	31.6	185	155	0.32%	1.6%
12			56.5	25.9	180	150	0.26%	1.5%
13			60.4	30.1	184	154	0.30%	1.5%
14			62.9	33.8	187	158	0.34%	1.6%

Assessment of Abnormal Operations

Although the proposed CHP plant would seek a separate environmental permit, the CHP Plant will be considered as part of the LNG Terminal and it is highly unlikely that both the CHP Plant and all 15 SCVs would operate at full capacity simultaneously and independently of each other. It is possible that each facility will operate independently in isolation, as the LNG Terminal currently does, or the CHP Plant would if there was demand for electricity at a time when there was no demand for gas.

In order to assess the potential impacts of this abnormal operational scenario, emissions from both the CHP Plant and all of the existing 15 SCV units were modelled together. As this scenario would only occur for a short period during abnormal operations, the results for the short-term pollutants are presented (99.79th percentile of hourly mean NO_2 and maximum 8-hour mean CO).

Table 10: 99.79th Percentile 1 Hour Mean NO_2 predictions

Receptor	AQO (µg.m-3)	AC (µg.m-3)	PC – CHP + 15 SCVs (µg.m-3)	PEC – CHP + 15 SCVs (µg.m-3)	PC/AQO – CHP + 15 SCVs (%)	PEC/AQO – CHP + 15 SCVs (%)
1	200	20.8	44.5	65.3	22.2%	32.6%
2			39.9	60.7	20.0%	30.4%
3			38.5	59.3	19.3%	29.7%
4			51.8	72.6	25.9%	36.3%
5			50.8	71.6	25.4%	35.8%
6			57.4	78.2	28.7%	39.1%
7			67.9	88.7	34.0%	44.4%
8			51.8	72.6	25.9%	36.3%
9			42.7	63.5	21.4%	31.8%
10			64.1	84.9	32.0%	42.4%
11			60.2	81.0	30.1%	40.5%
12			41.0	61.8	20.5%	30.9%
13			48.7	69.5	24.3%	34.7%
14			41.7	62.5	20.8%	31.2%
15			59.9	80.7	29.9%	40.3%
16			61.6	82.4	30.8%	41.2%
17			73.2	94.0	36.6%	47.0%
18			85.1	106	42.5%	52.9%
19			52.2	73.0	26.1%	36.5%

Receptor	AQO (µg.m-3)	AC (µg.m-3)	PC – CHP + 15 SCVs (µg.m-3)	PEC – CHP + 15 SCVs (µg.m-3)	PC/AQO – CHP + 15 SCVs (%)	PEC/AQO – CHP + 15 SCVs (%)
20			53.6	74.4	26.8%	37.2%
21			44.5	65.3	22.2%	32.6%
22			152	173	76.0%	86.4%
23			135	156	67.4%	77.8%
24			99.4	120	49.7%	60.1%
25			158	178	78.8%	89.2%
26			82.3	103	41.1%	51.5%
27			43.4	64.2	21.7%	32.1%

Global Warming Potential

The Global Warming Potential (GWP) has been calculated using the H1 software tool. The GWP score of 1,215,038 is constituted by emissions of carbon dioxide (CO_2) from the combustion of natural gas (for energy generation) and electricity from public supply (for back-up generator testing).

The CHP Plant will ensure that thorough energy efficiency measures are in place, to reduce parasitic load of the CHP Plant and to ensure that heat is available and electricity recovery is maximised for use at the LNG Terminal or supply of electricity to the national grid, consistent with BAT.

The CHP Plant will only burn natural gas. Natural gas produces less CO_2 than coal or oil per unit heat content. Emissions of particulate matter and oxides of sulphur are negligible for plant burning natural gas.

The CHP Plant will require a greenhouse gas permit under which monitoring systems and metering will be provided to facilitate the calculation and reporting of carbon dioxide equivalent emissions.

Habitats assessment – air quality

The applicant has assessed the impact of nitrogen emissions on habitats sites in the area of the proposed installation. SACs, SPAs, SSSIs and non-statutory habitat sites have been identified and have been assessed against the critical levels and site relevant critical load functions.

The three identified European Sites considered in this application are:

1) Castlemartin Coast SPA (or proposed SPA)

2) Pembrokeshire Marine / Sir Benfro Forol SAC
3) Limestone Coast of South West Wales / Arfordir Calchfaen De Orllewin Cymru SAC

Only one SSSI has been identified:

1) Milford Haven Waterway

NRW agree with the applicant that the nutrient nitrogen deposition process contribution at the Pembrokeshire Marine SAC is likely to be greater than 1% of the critical load. The applicant predicts a nutrient nitrogen process contribution of up to 4% of the minimum critical load. The nitrogen deposition at the Pembrokeshire Marine SAC already exceeds the critical load.

The Pembrokeshire Marine SAC is located on the coastline in close proximity to the proposed installation with the nearest point of the habitat site is approximately 300m from the proposed stack.

NO_X critical levels

The applicant predicts that annual PEC NO_X emissions will not exceed the critical level at all habitats sites.

The daily NO_X process contribution at the Milford Haven Waterway SSSI is approximately 13µg/m^3, greater than 10% of the critical level of 75 µg/m^3. No modelling files or information relating to the location of the modelled SSSI receptors were submitted.

The applicant was asked to clarify their predicted daily NO_X impact at the Milford Waterway SSSI, including the location of their predicted concentrations and submit the associated modelling files as part of a Schedule 5 request for more information.

When the plant is operating under the proposed scenario of the CHP and 7 SCVs, predicted daily NO_X concentrations at Milford Haven Waterway SSSI are likely to be significantly higher than the applicants predictions, NRW cannot rule out the possibility of an exceedence of the NO_X daily critical level.

However, the predicted concentrations for the proposed operating scenario are likely to be less than the predicted concentrations for existing operations at the maximum consented limit (15 SCVs), based on NRW check modelling predictions.

Nitrogen and acid deposition

The applicant predicts that the process contribution of nutrient nitrogen deposition will be less than 1% of the minimum critical load at all SACs/SPAs for both Scenarios 1 and 2, with the exception of Pembrokeshire Marine SAC.

At the Pembrokeshire Marine SAC the background nitrogen deposition already exceeds the minimum critical load function. The nutrient nitrogen deposition process contribution at the estuaries feature greater than 1% (up to 4%) of the minimum critical load.

The acid deposition process contribution is likely to be less than 1% of the minimum critical load function at all sensitive habitats.

At non-statutory sites the process contributions are likely to be below the relevant critical levels and loads. NRW agree that the predicted PC for acid deposition is not likely to contribute significantly to the critical load.

Applicant's habitats impact conclusions

The applicant concluded that "No Likely Significant Effects on SACs / SPAs were identified from the aerial deposition modelling" and that "The operation of the CHP plant would result in a decrease in NO_X concentrations and N deposition at all SAC/SPAs compared with that resulting from the existing maximum consented limit. NRW agree that there is unlikely to be an exceedence of the annual NO_X critical level at all habitats sites.

NRW agree that the predicted nutrient nitrogen deposition process contribution at the Pembroke Marine SAC is likely to be greater than 1% as the nitrogen deposition background level already exceeds the critical load. NRW agree that the predicted acid deposition process contribution is not likely to contribute significantly to critical loads at all habitats sites.

8. Emissions to water

Surface water emissions

Surface waters from the CHP Plant roofs, impermeable hardstanding (including car park and roads), and external areas of gravel and landscaping will be collected within surface water drains. Surface waters will ultimately flow via an oil interceptor and attenuation pond into the Waterway.

The primary mitigation measure that will be implemented to achieve the design principle referred to in the above paragraph, will be the construction of an engineered attenuation basin (the Primary Basin). The Primary Basin will have a maximum storage capacity of approximately 5,500 m^3. This volume will be available to ensure that the Primary Basin will be able to store the 1 in 30 year + 20% climate change 24-hour duration run-off volume generated by the new impermeable surfaces and also 2,000 m^3 of fire water run-off, without any immediate discharge to the Waterway. A maximum discharge flow rate of 500 litres/second under the 1 in 100 year +20% climate change event has been used as the design basis.

A flow control mechanism (such as a hydrobrake) will be installed at the outfall of the Primary Basin to control discharges into the existing LNG Terminal drainage system outlet to the Waterway. A penstock valve (manual or automated) will also be located at the outfall to prevent the discharge of water in the event of an accidental fuel or chemical spillage or an emergency fire event.

Once any spent fire water (and any concurrent storm water as described above) has drained to the Primary Basin, a second penstock valve (manual or automated) located at the entrance to the Primary Basin would be closed in order to prevent any further run-off entering the Primary Basin

There will be a smaller secondary storage basin (the Secondary Basin) located adjacent to the Primary Basin. This will capture run-off that may be generated when the Primary Basin is isolated, as set out above, and will be served with its own flow control unit to control discharges into the existing LNG Terminal drainage system outlet to the Waterway. It will be sized to provide a 1 in 2 year standard of attenuation (i.e. it will have a maximum volume of approximately 400 m^3 and will discharge at a rate no greater than 300 litres/second). The connection into the existing LNG Terminal drainage system will be undertaken under an agreement with LNG.

Appropriately sized oil/water interceptors will be installed at relevant locations throughout the CHP Plant Site in order to intercept and capture oil from potential spillages.

There will be monitoring of surface water releases from the CHP Plant into the LNG Terminal surface water discharge. Independent monitoring for the CHP Plant will be carried out upstream of the tie-in point into the LNG Terminal

discharge pipe. The tie in point will be located downstream of the LNG Terminal monitoring of surface water discharges.

The surface water drainage strategy has been developed to ensure no net increase in peak flow to the Waterway compared to existing surface water flows

Process water

The process waste waters will be combined within the process waste water treatment plant for the CHP Plant. After treatment these will discharge into the LNG Terminal process waste water effluent pipeline, with the combined discharges from the CHP Plant and the LNG Terminal ultimately discharging from the existing LNG Terminal discharge point into the Waterway. The combined discharge will not give rise to emissions greater than those in the LNG Terminal permit and the ELVs for the LNG Terminal and will not be exceeded during integrated mode of operations.

A new pipeline will be installed to route the CHP Plant process waste waters from the process waste water treatment plant into the LNG Terminal process waste water effluent pipeline. Monitoring equipment for the CHP Plant process waste water will be installed prior to the interconnection point.

Water use will be minimised through design (adoption of direct air-cooled fin-fan coolers rather than water-intensive cooling systems); closed loop systems (for exchange of hot water between the LNG Terminal and CHP Plant) and through good practice (reuse and return of condensates and control of boiler blow down rates). In addition to this the CHP Plant will have a raw water supply which will be supplemented by rainwater harvesting, details of the rain water harvesting scheme will be defined during the final design, therefore as a worst case in terms of water consumption the current water balance assumes all water supply to the CHP Plant is provided from the raw water supply.

Boiler blow-down water and the reject stream from the demineralised water treatment plant will be treated within the CHP Plant installation, in the process waste water treatment plant. The process waste water treatment plant will include an underground tank within which the reject stream from the demineralised water treatment plant and the boiler blow-down water will be collected and treated. This will also collect minor flows from the floor drains and HRSG sampling stream, equivalent to 1.0 m^3 per hour, which is equivalent to 0.3 litres per second. Treatment will include pH adjustment using acid and alkali dosing to neutralise the waste water, and settlement. The treated and cleaned waste water will discharge at a combined rate of approximately 14.2 m^3 per hour, equivalent to 3.9 litres per second at full load into the existing process waste water discharge drains used by the LNG Terminal and into the Waterway at the existing process waste water discharge point.

Sewer emissions

Waste water from amenities (such as toilets and canteens) will be discharged to the existing foul water sewer connection, which has sufficient capacity to accept the anticipated flow of approximately 0.1 m^3 per hour.

H1 assessment

A screening assessment has been undertaken of point source emissions to surface water associated with the proposed CHP Plant process. The assessment has been completed utilising the H1 software tool and is based on conservative assumptions. The purpose of completing the screening assessment is to identify those effects which require a more detailed assessment. The relevant process discharges to water from the CHP Plant are:

- Ammoniacal nitrogen;
- Zinc;
- Lead;
- Copper;
- Nickel; and
- Free chlorine.

Point-source emissions to water from the proposed CHP Plant will be from a single point at the LNG Terminal jetty. This release point will be located in Milford Haven at the mouth of the River Cleddau, and is characterised as a lower estuary / coastal environment. The receiving waters form part of a special area for conservation (SAC). The mean effluent flow rate will be 14.2 m^3/hr.

Estimated emissions have been screened for significance against relevant Environmental Quality Standards (EQSs), as given in H1 Environmental Assessment and Appraisal of BAT. For all of the pollutants assessed, the EQSs are expressed as annual averages (AA) and no maximum allowable concentration (MAC) has been set.

Process contributions to water (PC) have been based on the initial dilution rate, water temperature and pH specified in the Thermal Discharge: Dilution and Dispersion Study. Where the PC is calculated to be less than 4% of the long-term (AA) EQS, the pollutant is screened out as insignificant. The H1 software tool shows that long-term ammonia and zinc emissions cannot be screened as insignificant on this basis with PCs of 1.64 µg/l (or 7.79% of the EQS) and 2.11 µg/l (or 5.27% of the EQS) respectively, and therefore require further assessment.

The PEC for ammonia and zinc has been calculated using the H1 software tool. Background concentration data have been established by water quality sampling carried out by EA Wales (now NRW) and RPS (specified in the Thermal Discharge: Dilution and Dispersion Study. The H1 guidance indicates, non-prescriptively, that further assessment may be required if the long-term PEC were more than 70% of the EQS and/or the protected habitats or sensitive ecological receptors are nearby. The H1 software tool shows that the long-term PEC for ammonia would be 13.2% of the long-term EQS, below 70%. For zinc the long-term PEC for zinc would be 85.3% of the EQS, this largely as a result of a high background level at 32 µg/l compared to an EQS of 40 µg/l.

The H1 Annex D Surface Water Discharge guidance also notes that although an EQS is provided for ammonia, a water quality modelling approach should be used rather than simple screening approach.

The H1 software tool shows that emissions of process discharges of zinc and ammonia to surface waters cannot be screened out as insignificant. The effects of these discharges have therefore been assessed further.

NRW questioned whether the increase ammonia would give rise to increased nitrogen to the Milford Haven Waterway. An assessment of the discharges to water for ammonia, zinc, lead, copper and nickel was undertaken with H1. For ammonia H1 predicts a 96.42kg/yr increase at a concentration of 0.776mg/l with a flow rate of 0.00394m^3/s.

NRW asked the applicant to demonstrate that the amount of NOx reduced from the new scenario will offset that of the additional ammonia released to air to the waterway.

The applicant has demonstrated that N aerial emissions 1866kg/yr minus 1325kg/yr gives a 541kg/yr reduction. This would offset the additional discharge of ammonia.

For emissions to water N aqueous emissions14928kg/yr to 7592kg year = 7336kg/yr. At present the ELVs for the LNG permit remain unchanged with an additional discharge of ammonia proposed. The applicant was asked to demonstrate how the permit will be amended to reflect lowering of emissions from the CHP / LNG discharge point.

If the site is running in normal mode then there would be a reduction in the flow but this would not be reflected in the permit emission limit values (ELVs).

The applicant responded stating that the above calculations based on data provided within Appendix E (H1) and Appendix G (HRA) in the permit application demonstrate that there are reductions in nitrogen loads to the Milford Haven both from aqueous releases and from aerial sources.

It should be noted that the releases to air from the CHP Plant do not include ammonia, nitrogen deposition to Milford Haven arises as a consequence of NOx emissions. Ammonia is released within the aqueous discharges.

The SH CHP Plant discharges to water will combine with discharges from the LNG Terminal and discharge from the existing permitted outfall (W2), as described in the application. As indicated within the permit application, and forming part of the HRA assessment, the combined discharge into Milford Haven will not exceed the current limits for those parameters regulated under the LNG Terminal permit.

The LNG Terminal permit currently includes limits to control this discharge into the Haven. The LNG terminal has applied for a variation to their permit to offset the emissions. The habitats assessment describes the details of this further in section 10 of the decision document.

9. Noise emissions

The noise impact assessment has been undertaken as part of the Development Consent Order (DCO) application. Operational noise is only considered as part of the Environmental Permitting Regulations. The noise assessment received as part of the application was assessed by NRW and a number of errors were raised. Based on this NRW recommended that the applicant re-submit their noise impact assessment taking these issues into account.

A Schedule 5 Notice was sent on 21st February 2014 detailing the associated issues. As a result the applicant undertook a new noise assessment addressing these issues that was received on 12th March 2014. This revised assessment submitted to NRW has been used as a basis for NRW s comments.

The applicant, as part of their re-submitted noise assessment, addressed all the issues raised by NRW. A copy of the Schedule 5 response can be found on the public register.

The Applicant predicts that the operational impacts from the proposed CHP plant will be below marginal significance under a BS 4142 at sensitive receptors. NRW check modelling and sensitivity analysis agrees, provided the plant is designed and operated to the sound emission levels detailed in the Applicant's assessment and that the plant operates with none of the acoustic features associated with the +5dB rating correction being audible at sensitive receptors i.e. there are no tonal noises (distinguishable, discrete continuous notes), impulsive noises or noises irregular enough to attract attention from the plant audible at sensitive receptors.

However, applying the +5dB rating correction at all receptors NRW checks indicates that, under Integrated Operations, the difference between the rating level and background could be up to marginal significance and under Independent Operations greater than marginal significance at Herbrandston Hall. At Lodge Farm the difference could be up to marginal significance under Independent Operations.

Although the Applicant has justified not factoring in the +5dB rating NRW have incorporated pre operational condition1 and 2 into the permit as well as improvement condition1. These conditions are to ensure the actual operations at the site is in line with the modelling undertaken and where there are inconsistencies between the modelling and actual data that mitigation measures be put in place.

NRW have set pre operational conditions as well as improvement conditions to ensure that noise will not be an issue at South Hook CHP. PO1 requires the noise assessment to be revised if the current design differs to that of the final design. PO2 requires the commissioning plan to be agreed with NRW. The commissioning plan should contain a noise impact assessment of the equipment during the test running as well as tests to demonstrate that the

sound reduction proposed for the buildings are achievable. PO2 also requires a comparison of the predicted noise levels with those recorded during commissioning.

On completion of the pre operational conditions IP1 requires a noise survey to be undertaken once the installation is fully operational. The results from the survey are to be compared to those predicted as part of the application with any increases in noise levels identified and mitigation measures proposed to NRW for agreement.

In addition condition 3.4 of the permit requires the Operator to produce a noise and vibration management plan to identify and minimise any risks of pollution from noise and vibration.

10. Habitats impact review

Sections 7 and 8 of the decision document contain the risk assessments undertaken for emissions to air and water and their associated impacts on ecological sites. This section further details the requirements of a Habitats Regulations Assessment and assesses the impact against specific site objectives.

The Habitats Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna (the Directive) provides legal protection for habitats and species of European importance. The Directive is transposed into UK law by the Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations 2010). Regulation 61 of the Habitats Regulations 2010 requires the Competent Authority, before deciding to give consent for a plan or project which:

> *i. is likely to have a significant effect on a European Site (either alone or in combination with other plans or projects), and*
>
> *ii. is not directly connected with or necessary to the management of that site.….to make an, appropriate assessment of the implications for that site in view of its conservation objectives.*

If the conclusions of the assessment are negative in that the development will adversely affect a European Site despite proposed avoidance or mitigation measures, then the competent authority may only agree to the plan or project if there are no alternative solutions, there are Imperative Reasons of Overriding Public Interest and compensatory measures are secured.

A Habitats Regulations Assessment (HRA) report potentially has four stages that must be considered before a plan or project can be consented. These are summarised in Figure 1 of the Planning Inspectorate's (PINS) Advice Note 10 (*Habitat Regulations Assessment relevant to nationally significant infrastructure projects)*, and are:

- Stage 1: Screening
- Stage 2: Appropriate Assessment
- Stage 3: Assessment of alternatives
- Stage 4: Assessment of Imperative Reasons of Overriding Public Interest

The European Sites considered within this assessment are:

- Castlemartin Coast SPA (or proposed SPA)
- Pembrokeshire Marine / Sir Benfro Forol SAC
- Limestone Coast of South West Wales / Arfordir Calchfaen De Orllewin Cymru SAC

The Site of Special Scientific Interest considered is:

- Milford Haven Waterway

This site has been considered as the Pembrokeshire Marine SAC.

Figure 2: Site in relation to habitats sites identified in relation to South Hook CHP

Due to the sensitivity of the Pembrokeshire Marine SAC and the associated Conservation Objective any addition of nutrients to the SAC presents a risk to maintaining its current status and not affect the integrity of the site. As a result of the interactions with the LNG site there will be a net reduction in the discharge to water of N.

The installation is a new emission point and has the potential to have an in-combination effect but has an overall reduction in emissions due to the operating scenario with LNG and the reduced ELVs put in the revised LNG permit. This application could not act in combination with permissions and/or plans/projects of other competent authorities. Consultation has been undertaken and our conclusion is that sufficient measures have been put in

place to ensure there are no additional impacts to the identified European Sites. NRWs assessment concludes that there will be no likely significant effect.

Assessment of proposed discharge from South Hook CHP

Table 12: Castlemartin Coast SPA

3.8 Birds of coastal habitats (Chough (3.8))	Acidification	**Mechanism for effect**
	Disturbance (noise)	
	Nutrient Enrichment	

Table 13: Limestone Coast of South West Wales / Arfordir Calchfaen De Orllewin Cymru SAC

1.10 Coastal Habitats (Fixed dunes with herbaceous vegetation (grey dunes) (Priority Feature))	Nutrient Enrichment	**Mechanism for effect**
1.11 Coastal habitats (sensitive to abstraction) (Vegetated sea cliffs of the Atlantic and Baltic coasts	Nutrient Enrichment	**Mechanism for effect**
1.13 Submerged marine habitats (Submerged or partly submerged sea caves)	Nutrient Enrichment	**Mechanism for effect**
1.7 Dry grassland (Semi-natural dry grasslands and scrubland facies: on calcareous substrates)	Nutrient Enrichment	**Mechanism for effect**
1.8 Dry heathland habitats (Dry heaths (all subtypes))	Acidification	**Mechanism for effect**
	Nutrient Enrichment	
2.3 Vascular plants of grassland (Early gentian)	Acidification	**Mechanism for effect**
	Nutrient Enrichment	
2.4 Mosses and Liverworts (Petal wort)	Acidification	**Mechanism for effect**
	Nutrient Enrichment	

The existing core management plan for the Castlemartin Coast SPA is incorporated within the core management plan for the Limestone Coast of South West Wales. The version referred to in this Appendix 11 is version 10 dated 20th May 2008. The plan has conservation objectives for all the features identified for the SPA / SAC.

The assessment demonstrates that there will be no increase in pollutants associated with acidification and/or nutrient enrichment and with the CHP and LNG operating in an integrated mode there will be a reduction in emissions. Noise associated from the site will not impact upon the SPA/SAC due to the Installation being 5km to the North of the designated areas.

Table 14: Pembrokeshire Marine / Sir Benfro Forol SAC

1.11 Coastal habitats (sensitive to abstraction) (Coastal Lagoons (Priority Feature))	Nutrient Enrichment	**Mechanism for effect**

1.12 Estuarine & intertidal habitats (Atlantic salt meadows, Estuaries, Large shallow inlets and bays, Mudflats and sandflats not covered by seawater at low tide, Reefs)	Nutrient Enrichment	**Mechanism for effect**
1.13 Submerged marine habitats (Reefs, Sandbanks that are slightly covered by sea water all the time., Submerged or partly submerged sea caves)	Nutrient Enrichment	**Mechanism for effect**
2.11 Coastal plants (Shore dock)	Nutrient Enrichment	**Mechanism for effect**
2.12 Marine mammals (Grey seal)	Disturbance (noise)	**Mechanism for effect**
2.5 Anadromous fish (Allis shad, River Lamprey, Sea lamprey, Twaite shad)	Acidification	**Mechanism for effect**
	Nutrient Enrichment	
2.9 Mammals of riverine habitats (Otter)	Acidification	**Mechanism for effect**
	Disturbance (noise)	
	Nutrient Enrichment	

The core management plan referred to when completing this appendix 11 is the Advice provided by the Countryside Council for Wales in fulfilment of Regulation 33 of the Conservation (Natural Habitats,&c.) Regulations 1994 dated February 2009. This document sets out the associated objectives for the identified features. Primarily the objective for Pembrokeshire Marine SAC states:

> *In the Milford Haven waterways complex inputs of nutrients and contaminants to the water column and sediments derived from human activity must remain at or below levels at the time the site became a candidate SAC.*

As with the assessment for the Castlemartin SPA and the Limestone Coast of South West Wales SAC the assessment demonstrates that there will be no increase in pollutants associated with acidification and/or nutrient enrichment and with the CHP and LNG operating in an integrated mode there will be a reduction in emissions.

The Applicant has undertaken a noise assessment to demonstrate that noise associated from the site will be below marginal significance. Based on the findings from the noise assessment the impact from noise is not likely to impact upon the Grey Seal.

South Hook CHP and LNG emissions to water and air

The CHP is designed to operate in an integrated mode with the LNG as this provides the highest efficiency capable. However, the LNG needs to be able to run independently of the CHP and vice versa. This could be due to low

send out from the LNG or from the CHP as well as possible scenarios when maintenance is being undertaken at either installation. In a worst case scenario where the CHP is running at 100% and the LNG is also running at 100% send out but they are not operating in an integrated mode the applicant needs to be able to demonstrate that there is still no increase of emissions to the Pembrokeshire Marine SAC.

Discharge to water from the CHP

An assessment of the discharges to water has been undertaken with H1. For ammonia H1 predicts a 96.42kg/yr increase at a concentration of 0.776mg/l with a flow rate of 0.00394m^3/s.

Discharge to air from the CHP

Data for the CHP discharging independently of the LNG was not undertaken as this is not a scenario envisaged. However, for the purpose of this assessment NRW have used the results from the CHP running at 100% and supplying the SCVs as a very worst case scenario. The amount of N discharged from air emissions would be 1499 kg / yr.

Therefore the total N from emissions to water and air is 96.42 + 1499 = 1595.42 kg / yr.

Table 15: Amendments to the South Hook LNG permitted discharge

	Units	**Existing**	**Proposed**
Flow (max)	m^3/hr	164	144
Daily flow	m^3/day	3500	3100
Nitrates as N	mg/l	50	50
Nitrates as N	kg N/day	100	90
Nitrates as N annual mean	kg N/day	50	45

With the nitrates limit of 50mg/l and with the daily flow rate reduced from 3500 to 3100 m^3/day there will be a total reduction of 20kg/day nitrates with an annual reduction of 7300kg/year. These reductions are based on the LNG operating independently of the CHP and at 100% of the permitted ELVs.

The amount offset by the LNG would be 7300kg/year, offsetting the combined discharges to air and water of 1595kg/year with an additional 5705kg/year reduced by the revised permit ELVs.

The emissions to air from the LNG remain unchanged and therefore not considered in this comparison of ELVs.

When the CHP and LNG are operating in the integrated mode then the reduction would be more as there would being less nitrates discharged through the LNG to water and the emissions to air would reduce from the SCVs that have their warm water supplied from the CHP.

When considering the impact of Nox emissions to air over the whole Cleddau catchment the same conclusion can be made as there would be a reduction to emissions to air with the CHP and LNG running in an integrated mode.
A Habitats Regulations assessment was submitted as part of the EPR application referenced Appendix G. This assessment contained the Habitats Regulation Assessment, Assessment on European Sites (as used in the DCO application), an assessment of the Ecology Air Quality Impact Assessment (as used in the DCO application) and an assessment on the Nitrate Discharges to Milford Haven.

The Habitats Regulation Assessment concluded that there are no adverse effects on the integrity of any European Sites from South Hook CHP.

11. Site condition report

The Applicant has to satisfy us, if it wants to surrender the Permit, that the necessary measures have been taken, both to avoid any pollution risk resulting from the operation of the Installation, and to return the site to a satisfactory state, having regard to the state of the site before the Installation was put into operation. To do this, the Applicant has to apply to us for surrender, which we will not grant unless and until we are satisfied that these requirements have been complied with

Overview

The South Hook Combined Heat and Power (CHP) Plant, is located adjacent to the existing South Hook Liquefied Natural Gas (LNG) Terminal in Milford Haven, Wales. The area occupied by the CHP Plant will cover an area of approximately 10 ha, with an additional area of 4 ha for a future carbon capture facility. The overall area containing the CHP Plant, LNG Terminal as well as drainage and access requirements will amount to approximately 31 ha. A further 30 ha of land is required for temporary land works during the construction which will be outside of the operational footprint included within the permit boundary.

The current installation boundary for the LNG Terminal includes land that will be included within the CHP Plant. No permitted activities have been carried out on this land since the LNG Terminal commenced operation. South Hook LNG Terminal Company Limited will be seeking a partial surrender to remove land currently within their installation boundary which will subsequently be occupied by the CHP Plant.

The applicant has undertaken an assessment of the condition of the land. The primary purpose of this report is to provide information to Natural Resources Wales in relation to the planned operations, and to provide them with a framework against which the potential future contamination issues will be assessed. The report has been structured in accordance with the Environment Agency's Horizontal Guidance Note H5: Site Condition Report Guidance and Template.

Historically the site was predominantly rural before the development of the former ESSO oil refinery in the 1960s. The oil refinery was subsequently decommissioned with the removal of the main equipment and most of the associated infrastructure. A number of the former tank bases were retained as a nature conservation area under the terms of an S106 agreement pursuant to the consent for the LGN Terminal. A number of the drains that were built around the oil storage tanks are still detailed as being in place. These will be cut off and replaced as one of the early works, during the construction of the CHP Plant and implementation of the surface water management system. The adjacent LNG facility occupies a much smaller footprint at the site than the oil refinery.

The laboratory analysis recorded generally low levels of contaminants within the soils with all concentrations lying below appropriate SGVs / GACs.

Asbestos containing materials have not been identified, although asbestos fibres were encountered within the soil matrix at two isolated locations. Due to the isolated nature of the occurrences and the likely implementation of hardstanding as part of the development, risks to future site users from asbestos are deemed to be negligible.

During operation of the CHP Plant, risks to controlled waters are deemed to be low due to the discontinuous nature of the shallow (perched) groundwater and the low sensitivity of the site from a controlled waters perspective. Quantities of chemicals used by the CHP Plant are relatively small and these will be contained and controlled.

The results of the analysis of groundwater samples taken from the deeper groundwater have also recorded generally low contaminant concentrations with some isolated and highly localised spikes.

Risks due to ground gas are deemed to be negligible due to the nature of the made ground encountered. The made ground comprises predominantly reworked natural soils and did not contain putrescible material, therefore there is no source of gas on site.

Having considered the information submitted in the Application, NRW are satisfied that the submitted information provides sufficient information to describe the condition of the land at the time of permit issue.

ANNEX 1: Pre-Operational Conditions

Based on the information in the Application, we consider that we need to impose pre-operational conditions. These conditions are set out below and referred to, where applicable, in the text of the decision document. We are using these conditions to require the Operator to confirm that the details and measures proposed in the Application have been adopted or implemented prior to the operation of the Installation.

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
1	The Operator shall confirm with Natural Resources Wales that the design of the installation has not changed from that submitted as part of the noise assessment submitted received on 21st February 2014. If the design has changed the Operator shall revise the Noise Assessment submitted in response to the Schedule 5 response dated 21st February 2014, and re-submit the assessment to Natural Resources Wales. The revised assessment shall include the design details for the room dimensions, what the walls and roofs will be made out of and what the sound power levels and quantity of machinery will be in each room. If the site boundary changes during the detailed final design of the installation the Operator shall submit revised drawings to Natural Resources Wales for written approval.
2	The Operator shall provide a written commissioning plan, including timelines for completion, for approval by Natural Resources Wales. The commissioning plan shall include the expected emissions to the environment during the different stages of commissioning, the expected durations of commissioning activities and the actions to be taken to protect the environment and report to Natural Resources Wales in the event that actual emissions exceed expected emissions. The commissioning plan shall include but not be restricted to: • A noise impact assessment as regards the test running of equipment during the commissioning phase where there is considered to be a necessity to run individual items for short periods without full noise control mitigation measures in place. The assessment shall evaluate the appropriateness of applying temporary attenuators to any venting activities undertaken as part of the purging of pipework and equipment before normal duty operation. The assessment shall also detail how commissioning activities will be scheduled such that the potential impact on sensitive receptors is minimised. • Operator shall carry out appropriate tests and measurements to demonstrate that each building has been designed and constructed to achieve the sound reduction indices modelled as part of the Schedule 5 response dated 21st February 2014, and that the sound power levels and internal reverberant sound pressure levels are also in line with those set out in Application. A report on the testing and measurements shall be submitted to Natural Resources Wales. • Proposals to undertake a noise survey to assess the impact of the Installation during commissioning and the comparison of measured data against the information supplied in the Schedule 5 response dated 21st

	February 2014. The proposals shall also detail the methods to be used to assess tonal noise at sensitive receptors. • Determination of the daily average ELVs for NOx and CO from MSDL to MCR, as required by the Implementing Decision 2012/249/EU in terms of: i. The output load (i.e., electricity, heat or power generated) (MW); and ii. This output load as a percentage of the rated thermal output of the combustion plant (%). And / Or i. Three criteria (operational parameters or discrete processes) which can be met at the end of start-up or start of shut-down as detailed in Article (9) 2012/249/EU. • With reference to SU/SD and emissions data, determine the ELVs SU and SD to MCR load and the method by which they were derived. • The Operator shall propose daily and monthly averages ELVs for Nitrogen Oxides as NO_2. Commissioning shall be carried out in accordance with the commissioning plan as approved in writing by Natural Resources Wales.
3	The Operator shall submit, for approval by NRW, an overview of the Environment Management System (EMS) to be incorporated and make available, on request from NRW, for inspection all documents and procedures which form part of the EMS. The EMS will encompass an Accident Management Plan in line with the final design of the plant. The EMS shall be developed in line with the requirements set out in Section 1 of How to comply with your environmental permit (Version 6 June 2013). The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit.
4	A written procedure shall be submitted to Natural Resources Wales detailing the measures to be used so that monitoring equipment, personnel and organisations employed for the emissions monitoring programme shall have either MCERTS certification or accreditation in accordance with condition 3.5.3. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the procedure. The procedure shall be implemented by the operator from the date of approval in writing by Natural Resources Wales

ANNEX 2: Improvement Conditions

Based in the information in the Application we consider that we need to set improvement conditions. These conditions are set out below - justifications for these are provided at the relevant section of the decision document. We are using these conditions to require the Operator to provide Natural Resources Wales with details that need to be established or confirmed during and/or after commissioning.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
1	The Operator shall:	
	(a) Submit to Natural Resources Wales at the Reporting Address for approval written proposals for carrying out a noise survey to assess the impact of the Installation when fully operational. The proposals shall include the comparison of measured data against the information supplied Schedule 5 response dated 21st February 2014. This will involve establishing whether any of the noise emissions have a tonal quality (both during daytime and night time operation) likely to give rise to nuisance or complaint. The proposals shall also contain details of the methods to be used for the assessment of tonal noise at sensitive receptors and proposed a timeframe within which the survey will be undertaken;	Within 6 months of commissioning
	(b) Carry out the noise survey in accordance with Natural Resources Wales's written approval;	In accordance with NRWs approval
	(c) Submit a written report of the findings of the noise survey to Natural Resources Wales at the Reporting Address for approval; and	2 months after completion of (b)
	(d) Submit to Natural Resources Wales at the Reporting Address for approval a written report which assesses whether any minor improvements and modifications are required. Where such improvements or modifications are required, the Operator shall provide a timescales for their implementation, and, if required, an associated cost benefit analysis.	2 months after completion of (c)
	(e) Undertake a review of the actual noise emissions from the first year of operation at the installation and their impact with those predicted in the revised noise assessment.	12 months from first day of Operation.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
2	The Operator shall submit a written report to Natural Resources Wales on the implementation of its Environmental Management System and the progress made in the accreditation of the system by an external body or if appropriate submit a schedule by which the EMS will be subject to accreditation.	12 months from first day of commercial Operation.
3	The Operator shall submit to Natural Resources Wales at the Reporting Address a written report on the completion of the commissioning plan detailed in pre operational condition 2. It shall report in accordance with the approved commissioning plan and shall detail: – The environmental performance of the Installation as installed against the design parameters set out in the Application; – The performance of the turbines under various operating loads and start-up (both hot and cold) and shut-downs; – Confirmation of the thresholds for Minimum Start-Up Load (MSUL)/Minimum Shut-Down Load (MSDL), and, if required operational parameters; – Confirmation of the proposed daily mean ELVs for Nitrogen Dioxide and Carbon Monoxide between MSUL/MSDL and 70% load; – Confirmation of the proposed daily and monthly ELVs for Nitrogen Dioxide for 70% load to 100% load; – Confirmation of the proposed hourly, daily and monthly ELVs for Carbon Monoxide for 70% load to 100% load; – A comparison of the efficiency and performance of the unit; – A review of the performance of the Installation against the conditions of this Permit; – The procedures developed during commissioning for achieving and demonstrating compliance with permit conditions; – The results of the commissioning phase noise survey in line with the approved proposals; and – The results of calibration and verification testing that the performance of Continuous Emission Monitors for parameters as specified in Table S3.1 complies with the requirements of BS EN 14181, specifically the requirements of QAL1, QAL2 and QAL3 The Report shall also detail any minor improvements and modifications identified as part of the commissioning and a timetable for their implementation. Any changes approved in writing by Natural Resources Wales shall be implemented in accordance with that approval.	2 months from the completion of the commissioning plan

ANNEX 3: Consultation Reponses

A) Advertising and Consultation on the Application

The Application has been advertised and consulted upon. The way in which this has been carried out along with the results of our consultation and how we have taken consultation responses into account in reaching our draft decision is summarised in this Annex. Copies of all consultation responses have been placed on the NRW public register.

The Application was advertised on the Natural Resources Wales website from 29/11/13 to 10/101/14 and in the Milford Mercury on 29/11/13. Copies of the Application were placed on our Public Register held at Natural Resources Wales, Maes Newydd, Llandarcy, Port Talbot, SA10 6JQ and also sent a copy to the Pembrokeshire County Council, North Wing, County Hall, Freemans Way, Haverfordwest, Pembrokeshire, SA61 1TP for its own Public Register.

The following statutory and non-statutory bodies were consulted: -

- Pembrokeshire County Council Local Planning Department
- Pembrokeshire County Council Environment Protection Department
- Pembrokeshire Coast National Park Authority
- Welsh Government fisheries department
- Centre for Environment, Fisheries and Aquaculture Science
- Milford Haven Port Authority
- Food Standards Agency
- Health and Safety Executive
- National Grid
- South Hook LNG Terminal

1) Consultation Responses from Statutory and Non-Statutory Bodies

Response received from NHS Wales Hywel Dda University Health Board	
Brief summary of issues raised:	Summary of action taken / how this has been covered
The following recommendations were made: • Once the additional plant is operational that actual emission data is used to confirm the emission to atmosphere. • The Operator must ensure that there shall be no discernible odour outside of the boundary of the installation likely to give rise to annoyance to local communities.	The permit requires emission data to be reported to NRW, this can be used to verify the emission parameters used in the air quality assessment. An odour risk assessment has been undertaken with no odorous materials / processes undertaken on site. If odour was to become a problem at the installation permit condition 3.3 requires the Operator to provide an odour management plan

• All on site storage of liquids is suitable bunded in compliance with Environment Agency / NRW guidance. Similarly, that all waste storage facilities are in line with Environment Agency / NRW Guidance. • A timetable agreed for obtaining ISO14001 standard. • Once operational a noise survey undertaken to ensure that on-site activities will not cause nuisance to nearby receptors.	that would identify the source of odour and minimise the risk of odour. All bunded area is to achieve CIRIA C736 standard for the Containment systems for the prevention of pollution. Improvement Condition 2 requires accreditation of their EMS by an external body. Potential noise issues have been addressed through a series of pre operational and improvement conditions.

Response received from Pembrokeshire County Council (PCC)	
Brief summary of issues raised:	Summary of action taken / how this has been covered
PCC provided information that there have been a large number of complaints since 2009 relating to noise from vessels berthing at the SHLNG jetty. PCC have undertaken a lot of work to remedy this and the vessels of received upgrades to engine silencers with more to be upgraded. PPC have engaged with industry representatives, local residents, technical consultants to secure the upgrade work. As a result local residents have set up a website to highlight the noise problems encountered.	Potential noise issues have been addressed through a series of pre operational and improvement conditions.

2) Consultation Responses from Members of the Public and Community Organisations

a) Representations from Individual Members of the Public

The following responses were received from members of the public.

Response Received from members of the public	
Brief summary of issues raised:	Summary of action taken / how this has been covered
Concern was raised over the added pollution load on the Milford Haven waterway area from the stacks & Flares that already exist. Reference made to the following link: http://www.medicalnewstoday.com/articles/274088.php The article referred to the exposure of environmental toxins linked to autism incidence rates and questioned whether NRW has anyone that can interrogate the evidence in the UK?	The article "Exposure to environmental toxins linked to autism incidence rates" published in Medical News Today on Friday 14 March 2014 which to relate to genital abnormalities in males and links this to fetus exposure to harmful environmental factors, such as pesticides. The research that concluded this came from a report published in PLOS Computational Biology and earlier reports on autism. NRW does not have expertise in this field of medical research and relies on the expertise within Government, Local Heath Boards, NHS Wales and NHS England to provide guidance on such matters through consultation. As part of the application process H1 Environmental Risk Assessment tools was used. Annex F covers Air Quality and explains how the assessment is made.
Concerned was raised over the potential for noise from the fin fan coolers that are proposed to be used when no gas load is required on the grid? During this period the fin fan coolers will be required. The member of the public stated that last year the gas grid load had decrease and that import shipping was almost zero for prolonged	A noise assessment has been undertaken by the applicant that assesses the scenario where the CHP Plant operates in independent mode. Section 9 of the decision document details the assessment with NRWs comments.

periods, this would mean that for these prolonged periods the fin fan coolers would be running most of the time. This appears contrary to the statements in the PR? If the fin fan coolers are noisy, which the indication is they are, then the actual time of impact is greater than the isolated periods as claimed if this is the case can design technology ensure improvements are made before the site goes into operation?	

3) Matters on which the public may comment which may be more relevant to an application for Planning Permission or other matters

Location of the installation: Decisions over land use are matters for the planning system. The location of the installation is a relevant consideration for Environmental Permitting, but only in so far as it's potential to have an adverse environmental impact on communities or sensitive environmental receptors. The environmental impact is assessed as part of the determination process and has been reported upon in the main body of this document. The location of the installation can have an impact on the ability to recover waste heat for use in nearby residential, commercial or industrial premises and we commented on this in our consultation response to the local planning authority.

Vehicle access to the installation and traffic movements: These are relevant considerations for the grant of planning permission, but do not form part of the Environmental Permit decision making process except where there are established high background concentrations contributing to poor air quality and the increased level of traffic might be significant in these limited circumstances.