From: [redacted]
To: Wrexham Energy
Subject: Re: Wrexham Energy Centre (EN010055)
Date: 06 January 2017 15:01:19
Attachments: Answer to examiners question about steam plumes.docx

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Dear Examiner,

Firstly aplologies for the late response. I got my dates mixed up and genuinely believed I had until the end of business today to respond. I hope the attached response can still be included.

Therefore please find attached my response to your question about the cooling of Rocksavage Power Station and the photograph I submitted that shows the Plant plumes.

I have taken a second photograph yesterday (not submitted) of the same Plant when the air temperature was -1C. It shows that the Plant's plumes are reproducible when the surrounding air temperature is cold.

Within the attached document I've appended the relevant section of the Plant's IED Permit. This is available on the Environment Agency;s web page, should you wish to check it. Post code for the site is WA7 4FZ. It will help you to find the full Permit.

Kind regards,

Chris Briggs

On Monday, December 12, 2016 11:22 AM, Wrexham Energy <WrexhamEnergy@pins.gsi.gov.uk> wrote:

Dear Sir/Madam

Wrexham Energy Centre (EN010055)

Your reference: 10032194

Please follow the link below to view the letter: Requests for further information and comment

http://infrastructure.planninginspectorate.gov.uk/document/EN010055-001510

If this link does not open automatically, please cut and paste it into your browser.

Yours faithfully

Wrexham Energy Centre Team
3/18 Eagle Wing
The Planning Inspectorate
Temple Quay House

Temple Quay
Bristol
BS1 6PN

Email: WrexhamEnergy@pins.gsi.gov.uk
Helpline: 0303 444 5000

Web: www.planningportal.gov.uk/planninginspectorate (Planning Inspectorate casework and appeals)
Web: www.planningportal.gov.uk/infrastructure (Planning Inspectorate's National Infrastructure Planning portal)
Twitter: @PINSgov

Dear Examiner,

Firstly apologies for the late submission of this response, I got my dates mixed up and thought I had until the close of business on the 6th January 2017, and not the 4th, as I've just realised, to submit my response.

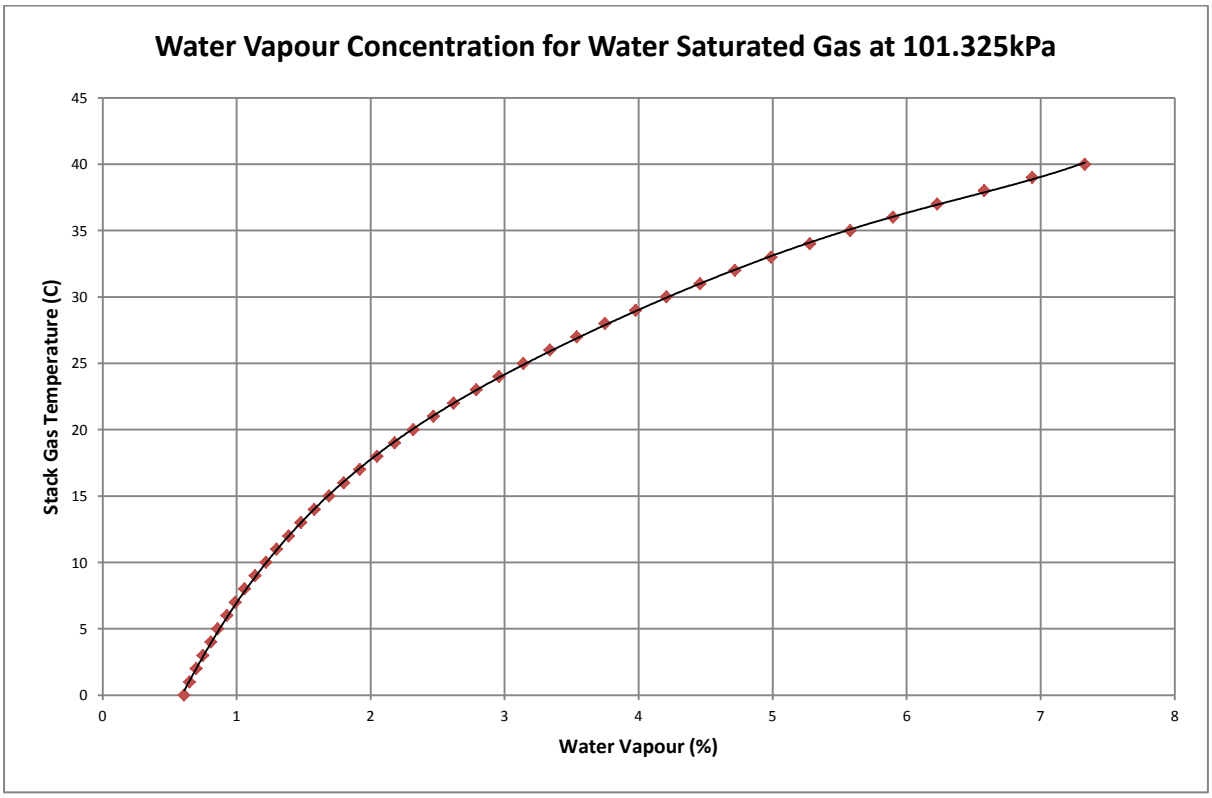
You asked how the Plant (Rocksavage Power Station) that I photographed is cooled. The short answer is it is water cooled. I have appended to this response the relevant text from the Site's Environmental Permit.

For the record English Environmental Permits are available on the Environment Agency's web page. Knowing that you don't allow web links I haven't added the link. You will have to perform your own internet search to confirm this. It would appear that Natural Resources Wales do not have such a facility. Welsh Environmental Permits have to be requested directly from NRW.

Given that the cooling is performed by water, then the steam plumes from the cooling towers can be ignored from my previous representation. However, irrespective of how the Plant is cooled the plume from the stack is still relevant.

In my daily working life I routinely use BS EN 14790:2005 Stationary source emissions - Determination of water vapour in ducts. That Standard contains a table within Appendix A (Normative) that shows the saturation point for a gas at 101.325kPa and any given temperature.

For ease I have graphed the saturation point as % moisture against stack gas temperature over the range of 0 to 40C.



So if a stack gas contains for example 5% moisture, then this moisture will remain in the gas phase so long as the stack gas is at 33C of above. In other words above the line the water vapour doesn't form visible steam. Below the line it does.

WPL have stated on page 8-21 in Table 8.4 that the potential stack gas emissions will contain 6.5% moisture and be at 363.15k (90C). They don't state if the 90C is the efflux (point at which the gas enters the atmosphere) temperature, but let's assume that it is. In practice stack gas temperatures aren't measured at the efflux point, they tend to be measured at the point where the Continuous Emissions Measuring System is installed, typically half way up the stack.

So from the table in BS EN 14790, then a gas containing 6.5% moisture will start to condense once the gas is cooled to below 38C. Obviously as the potential process emits its process gas, then it starts to become cooled and diluted as it enters the atmosphere.

As I stated in the last set of meetings, when the stack gas enters a cold environment, then the gas is cooled quickly and the water vapour content starts to become visible. It is for exactly the same reason that your breath and central heating boiler emissions are visible of a cold winter's day. I therefore still maintain that the photograph that I previously submitted is relevant to this application as it shows what is likely to happen to the stack gas on cold winter days.

When you read the appended section of the Rocksavage's environmental permit you will note that the stack height is stated as 70m.

I've performed a quick search of the Environment Agency's IED Permits Issued and read the introductory section of each Permit. In that section it lists, but not always, the Stack Height.

Below is a table of my findings:

Power Station	Stack Height (m)
Salt End Cogen	65
Rocksavage Power Station	70
Didcot B Power Station	85
Marchwood Power Station	70
Centrica Kings Lynn A – Decommissioned due to falling demand	Height not stated.
Centrica Kings Lynn B	Height not stated
Centrica Killingholme Power Station	75
Centrica South Humber Power Station	Height not stated

You will also note that the process is expected to give off sulphur dioxide emissions, a point that we have previously been ridiculed over, when it has been suggested that WPL could potentially emit sulphur dioxide.

The final sentence makes reference to noise abatement being of importance due to the fact that the plant is close to residential property.

Permit number EPR/BS5380IC

Introductory note

This introductory note does not form a part of the notice.

Under the Environmental Permitting (England & Wales) Regulations 2010 (schedule 5, part 1, paragraph 19) a variation may comprise a consolidated permit reflecting the variations and a notice specifying the variations included in that consolidated permit.

Schedule 1 of the notice specifies that all the conditions of the permit have been varied and schedule 2 comprises a consolidated permit which reflects the variations being made and contains all conditions relevant to this permit.

The requirements of the Industrial Emissions Directive (IED) 2010/75/EU are given force in England through the Environmental Permitting (England and Wales) Regulations 2010 (the EPR) (as amended).

This Permit, for the operation of large combustion plant (LCP), as defined by articles 28 and 29 of the Industrial Emissions Directive (IED), is varied by the Environment Agency to implement the special provisions for LCP given in the IED, by the 1 January 2016 (Article 82(3)). The IED makes special provisions for LCP under Chapter III, introducing new Emission Limit Values (ELVs) applicable to LCP, referred to in Article 30(2) and set out in Annex V.

As well as implementing Chapter III of IED, the consolidated variation notice takes into account and brings together in a single document all previous variations that relate to the original permit issued. It also modernises all conditions to reflect the conditions contained in our current generic permit template.

The Operator has chosen to operate this LCP under the ELV compliance route, i.e. complying with the emission limit values set out in part 1 of annex V of the Industrial Emissions Directive.

The net thermal input of the LCP's is as follows. LCP287 is one 712 MWth CCGT, LCP 401 is one 712 MWth CCGT.

The variation notice uses updated LCP numbers in accordance with the most recent DEFRA LCP reference numbers. The LCP references have changed as follows:
• LCP 233 is changed to LCP 287; and
• LCP 401 is a new LCP number.

The rest of the installation is unchanged and continues to be operated as follows:

The purpose of the installation is to generate electricity. 770MW of electricity can be generated by the installation. The installation comprises two 250 MW gas turbines (GT) fired by de-odourised natural gas, two heat recovery steam generators(HRSG) and one 270MW steam turbine.

Gas is burnt in the GT which rotates a generator producing electricity. The hot combustion gases (500-600°C) then pass through a HRSG which uses the heat in the gas to produce steam. Steam from the two HSRG's combine to pass through the ST, generating more electricity.

After the ST, the steam is condensed and cooled by water provided from a bank of 12 plume-abated forced air cooling towers. The condensed steam is returned to the HRSG for raising into steam again. This water is recycled because it has high purity. Some steam is allowed to escape (blow-down) to prevent the build up of solids and this enters the cooling water system. Make up water is treated to remove solids and achieve the correct balance for use in the HRSG.

Cooling water is provided from the bank of cooling towers. Significant losses occur due to evaporation of water and this is made up by fresh water. Also some water is deliberately removed (blow-down) to prevent build up of solids. This forms the bulk of the effluent.

After the HRSG the waste combustion gases are emitted to atmosphere via two 70 metre high stacks (one for each turbine). The combustion gases are mainly carbon dioxide and steam vapour, with oxides of nitrogen as the main by product along with carbon monoxide and a small amount of sulphur dioxide.

There is no stand by fuel available at the installation.

Other items in the installation are: materials storage, handling and receipt, water treatment plant, transformers, water tanks, emergency generator, auxiliary diesel fired boiler, waste water treatment and discharge to sewer, storm water collection and discharge to controlled waters.

The site is at Rocksavage, Runcorn and the installation is run by Rocksavage Power Company Limited. The main environmental effect is from combustion gases emitted to air (greenhouse gases), and oxides of nitrogen. The control of combustion and the techniques used are critical in minimising the environmental impact. The site is close to residential properties and noise abatement is important.

Kind regards,

Chris Briggs