Natural Resources Wales permitting decisions

Variation

We have decided to issue the variation for Aberthaw Power Station operated by RWE Generation UK plc

The variation number is EPR/RP3133LD/V011.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document:

- explains how the application has been determined
- provides a record of the decision-making process
- shows how all relevant factors have been taken into account
- justifies the specific conditions in the permit other than those in our generic permit template.

Unless the decision document specifies otherwise we have accepted the applicant's proposals.

Structure of this document

- Key issues

Key issues of the decision

The down-shot fired boilers installed at Aberthaw are unique in UK power generation plant and are designed to allow the use of indigenous low volatile coals. This variation allows the conversion to low NOX boilers (LNBo) at Aberthaw Power Station. The LNBo will allow the power station the ability to continue to burn indigenous low volatile coal with a significant reduction in NOX emissions.

The application required additional information to clarify how the reduction in NO_X emissions would be achieved. A schedule 5 Notice was sent to the Operator dated 14th May 2015 requesting an updated Air Quality impact assessment using extrapolated data from existing modelling and local monitoring data, considering likely future load factors. The operator provided a full updated air quality assessment that demonstrates that the low NO_X boiler modifications will result in reductions in the impact of the power station on local air quality and deposition. The NO_X boiler modifications will result in reductions in the station's contribution to the short-term impact of NO_2 by between 3% and 14% and long-term impacts by between 7% and 85% depending on load factors.

We also requested that the Operator demonstrate that the low NO_X boilers would show an improvement towards the critical loads of European Designated sites. The Operator provided information that demonstrated that the modelled annual mean NO_X concentrations are below the critical level for all sites. The proposed low NO_X boiler modifications will result in reductions in the station's contribution by approximately 14%. A revised appropriate assessment will be undertaken as part of the IED permit review which will be carried out late 2015 - early 2016. This appropriate assessment will incorporate the changes implemented by this variation.

Further to this we requested that the Operator consider the increase in carbon in ash levels in more detail. We requested demonstration that the projected increase in carbon in ash will not significantly impact the performance of the Electrostatic Precipitators and if there will be any impact upon seawater discharges from the Flue Gas Desulphurisation plant, performance of the ash reprocessing facility or dust releases to air. The Operator advised that carbon in ash will be at or better than current plant performance and therefore there will be little or no impact on ESP dust removal performance and consequential impact on seawater discharges, performance of the ash reprocessing facility, disposal of PFA to the quarry ash disposal site or dust releases to air.

It was also requested that the Operator provide technical reports to consider the performance of similar low NO_X boilers. The Operator provided information on the components of the type of system that will be deployed at Aberthaw. Information was provided but it was reiterated that there are differences between other plant employing this technology and Aberthaw. These include:-
- Differences in coal quality and volatile matter (VM)
- Differences in boiler design (although both are arch fired)
- Differences in mill, classifier type and over fire air design
- Differences in burner operation
- Cyclones were already installed pre LNBo
- Different commercial operation

Clarification was also required regarding the status of the current permission to install SCR across all three units, the requirement to use Thermal Input Biasing (TIB) and combustion control. We also requested an updated options appraisal demonstrating what BAT is for NOx control under the possible future operating regimes.

Status of the current permission to install SCR at Aberthaw.
The Operator clarified that market conditions have changed considerably since the decision to apply for a permit to operate SCR. It is no longer considered to be economic to fit SCR at Aberthaw. For the IED compliance option deemed likely for Aberthaw a higher NOx limit (450mg Nm^{-3}) than was assumed in the SCR options appraisal is applicable. This limit is achievable by the primary combustion measures already installed in combination with the Low NOx Boiler technology currently proposed for Aberthaw. The Operator requested that we remove references to SCR within the permit as SCR will no longer be fitted.

The status of Thermal Input Biasing (TIB) & Combustion Control
TIB is a technique that involves optimising the heat distribution in the furnace by controlling the burner firing pattern. The technique was demonstrated at Aberthaw to be capable of reducing NOx emissions by around 20% giving an emission concentration of 1200 mg Nm^{-3}. Operating issues included potentially increased carbon in ash; risk of increased dust emissions; some coal restriction and the risk of furnace wall tube failures. TIB was implemented in 2008 and is now in operation on all of Aberthaw's units. The operation of TIB can be improved by use of a NOx advisor system. This involves improved instrumentation and control systems designed to achieve the lowest NOx set-up. The use of this combustion control system has been shown to help to consistently achieve lower NOx over that obtained by TIB. The operational issues are the same as with TIB. The overall approach and techniques have been developed and proven and this system is now installed on all three units at Aberthaw. The operation of TIB and combustion control may be further improved by the use of dynamic classifiers. These in effect achieve better control of the size distribution and balance burner to burner for pulverised coal being fed to the burners. Improvements to pulverised fuel size distribution have the combined benefits of reduced carbon in ash, lower dust emissions and reduced NOx emissions. It is well known that such an improvement to combustion can achieve all three of these simultaneously, however, the interaction between these parameters is complex; for example optimisation to improve NOx emissions may result in increased carbon in ash, high dust emissions or increased slagging in the boiler and a balance must be found. All units at Aberthaw are now fitted with dynamic classifiers as well as thermal input biasing and combustion control. The use of these technologies allow the station to comply with the current limit.

Revised NOx abatement options appraisal
A revised options appraisal has been undertaken for NOx abatement at Aberthaw power station. The appraisal has used the same methodology for the calculation of costs and benefits as in the previous options appraisal. There are however a number of differences in the assumptions regarding available technologies, unabated NOx and load factors.

The average annual load factor used in the assessment of 17% reflects a 1500h compliance route post 2020. There is potential for Aberthaw to operate at a higher load factor during the TNP. As a sensitivity study the cost and benefits of abatement have also been assessed assuming a 50% load factor. A number of technologies

considered previously have been implemented at Aberthaw Power Station and are therefore not considered in this options appraisal. These are TIB, combustion control and dynamic classifiers. Technologies considered are Low NOx Boiler, SCR and Selective Non catalytic Reduction (SNCR). The base NOx limit assumed for the current assessment is the limit value that applies from 2016 onwards; 1050mg Nm^{-3}.

The use of LNBo provides the lowest cost option of achieving a stack gas NOx concentration of 450mg Nm^{-3}. SNCR alone is not capable of reducing stack gas concentrations to the required level. The cost of SNCR is also greater than that of LNBo. The use of SCR, both with and without LNBo, offers abatement below 450mg Nm^{-3} but at a significantly higher cost than for the LNBo technology alone. The use of SNCR with LNBo offers abatement below 450mg Nm^{-3} with a reduced cost compared to the options that include SCR. However compared to LNBo alone the use of LNBo plus SNCR is more significantly more expensive.

A sensitivity study has been undertaken assuming that Aberthaw's load factor was 50% to 2032. This is somewhat unrealistic as while greater than 17% load factors would be possible when operating within the TNP such high load factors would not be possible post TNP without abatement beyond 450mg Nm^{-3}. An increase in load factor to 50% does not change the overall conclusions of the cost benefit analysis. The relative values of the cost benefit data for a 50% load factor are similar to those for the 17% load factor case. For both cases LNBo provides the least expensive abatement option and SNCR alone is expensive, relative to LNBo, and does not achieve the required 450mg Nm^{-3}. The use of SCR and SNCR plus LNBo provides abatement beyond 450mg Nm^{-3} but at a significantly increased cost. Compared to the 17% load factor case the SNCR and SCR options increase in cost because of operational costs that increase with increasing load factor. The costs of SNCR options increase proportionally more than the SCR cost because operational costs are proportionally a greater component of the overall cost for that technology. In conclusion for the life and load factor currently expected the use of LNBo technology provides the most cost effective means of providing NOx abatement to required limits and should be considered as BAT at Aberthaw regardless of load.

Improvement Conditions

Based on the information in the application, we considered that we need to impose improvement conditions. We have included an improvement condition for the Operator to update their Accident Management Plan to take account of the LNBo units and we also included an Improvement Condition for the Operator to confirm the commissioning date of each Low NOx boiler unit and submit a written post-commissioning report regarding the emission reductions achieved and relevant performance parameters. These new improvement conditions have been included in Table S1.3 of the permit and for clarity these new improvement conditions are included below:

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
IC35	The operator shall carry out a review of the Accident Management Plan to take account of the installation of the Low NOx boilers and associated equipment. If the review extends to the entire installation then it will be deemed to have met the requirement of Condition 1.2.1 (b) The reviewed plan shall be submitted to NRW for approval, and the measures and controls identified in the approved plan shall be implemented within 12 months of the written approval of the report by NRW.	Within 3 months of unit 9 low NOx boiler unit being brought into operation.
IC36	Confirm the commissioning date of each Low NOx boiler unit and submit a written post-commissioning report regarding the emission reductions achieved and relevant performance parameters including but not limited to • noise • ash quality (and identification of need for PFA landfill HRA review) • carbon in ash levels • tube failure rates • start up, shut down thresholds and boiler stability • slagging • thermal performance • electrostatic precipitator performance • NOx emissions The report should include a justification of the Best Available Techniques Associated Emission Limits (BAT ELV's) to be adopted upon full implementation of all low NOx boilers. The report shall be submitted to NRW for approval, and the measures and controls identified in the approved report shall be implemented within 12 months of the written approval of the report by NRW.	Within 6 months of each Low NOx boiler unit being brought into operation.

Pre-operational Conditions

Based on the information in the application, we considered that we need to impose a pre-operational condition to request a report specifying the proposed commissioning programme and operating techniques for the first LNBo and subsequent changes for subsequent installations. This new pre-operational condition has been included in table S1.4 of the permit. For clarity table S1.4 with the new pre-operational condition is reproduced below.

Table S1.4 Pre-operational Conditions		
Reference	**Requirement**	**Date**
POC14	A written report shall be submitted to NRW for approval. The report shall specify the proposed commissioning programme and proposed operational techniques relating to the operation of the first Low NOx boiler. If there are any changes from the commissioning of this LNBo for any subsequent installations these shall also be reported.	Report to be submitted within 1 month of commissioning of the first Low NOx boiler. If the commissioning programme changes for subsequent installations, these reports shall be submitted at least three months before commissioning of each subsequent LNBo unit.

Habitats Assessment

The application is within the relevant distance criteria of a several designated sites. A full assessment of the application and its potential to affect the Dunraven Bay SAC, Severn Estuary SPA and Severn Estuary Ramsar has been carried out as part of the permitting process. We consider that the application will not affect the features of the sites. Therefore, we have not formally consulted on the application, we have sent a consultation document “for information only” to our protected sites teams because we consider that there will be no likely significant effect resulting from the issuing of this variation. The decision was taken in accordance with our guidance. A revised appropriate assessment will be undertaken as part of the IED permit review which will be carried out late 2015 - early 2016. This appropriate assessment will incorporate the changes implemented by this variation.