

Low NOx Boiler Commissioning Plan – Pre-operational measure POC14

Aberthaw Power Station EP RP3133LD/V012

Reference Number: RP3133LD/V012/POC14

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**RWE Generation UK plc Aberthaw Power Station
EP RP3133LD/V012**

Low NOx Boiler Commissioning Plan – Pre-operational measure POC14

Prepared for Natural Resources Wales

This report has been produced to fulfil the requirements of Pre-operational measure POC14 as part of Environmental Permit RP3133LD/V012:

A written report shall be submitted to Natural Resources Wales for approval within 1 month of commissioning of the first Low NOx boiler. 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 at least three months before commissioning.

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1. Introduction

This document specifies the proposed commissioning plan and proposed operational techniques for the installation of Low NOx Boiler (LNBo) Technology at Aberthaw Power Station. The first unit to be upgraded is Unit 9 and if the commissioning programme changes for any subsequent LNBo installations a new report will be submitted.

Aberthaw Power Station is installing LNBo Technology to reduce NOx emissions to air by up to 60%. The modifications provide a cost effective NOx abatement of stack gas concentrations expected to be in the range 450 to 600mg/Nm³. The LNBo system controls NOx by creating a stable flame and controlling the staging of air to the boiler. This process limits the formation of NOx thermally and from nitrogen contained within the fuel.

The key technical features of the LNBo Technology being fitted at Aberthaw Power Station include:

36 New Arch Burners comprising

- 72 vertical cyclones (two per burner)
- 72 burner new adjustable nozzles
- 72 cyclone vent pipes and dampers

36 New Overfire Air (OFA) systems comprising

- one OFA nozzle per burner
- new OFA ducting
- automated control dampers

24 Combustion Air Modifications

- secondary air manual pre-set dampers in top and middle airport walls
- secondary air control dampers in the lower airport walls
- secondary air shut-off dampers
- tertiary air control dampers

Mill Modifications

- amendment to mill ball charge to improve grinding capability
- dynamic classifier speed adjustments
- new instrumentation

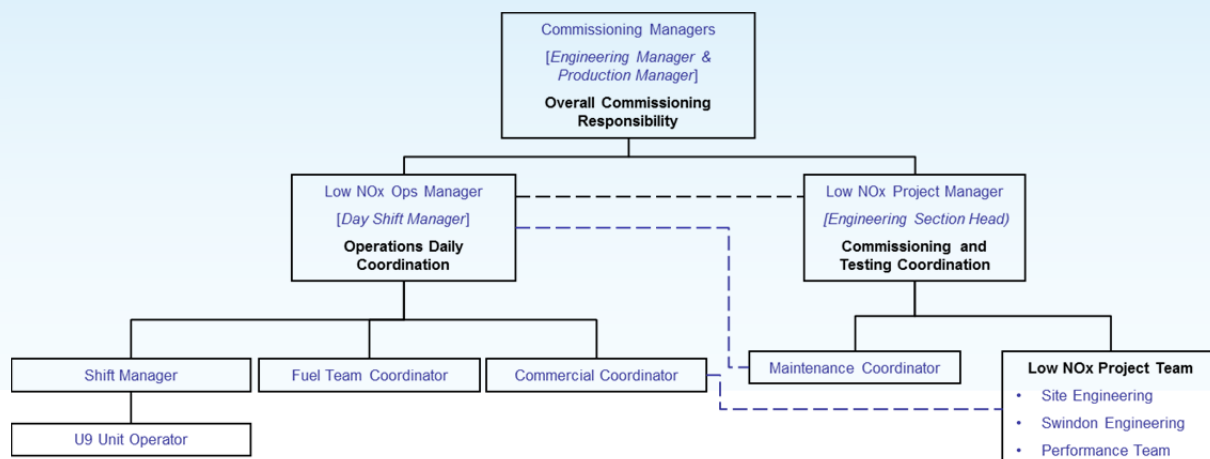
Control System Modifications

- automation of process control

2. Commissioning Strategy

The aims of the commissioning strategy are to optimise the modified process and combustion systems to improve the NOx emissions, and ensure that the unit continues to operate safely within other parameters such as efficiency, environmental performance and reliability.

A commissioning management organisation structure has been established, which details the responsibilities during the commissioning and optimisation phase and is shown below.



A commissioning and optimisation schedule is in place which sets out the long-term plan of tests and associated resources required to achieve these tests. This is reviewed on a regular basis.

A commissioning communication plan is in place which aims to ensure adequate short and medium term planning of the commissioning and optimisation activities and resolve any issues identified.

3. Commissioning Programme

The table below defines each stage of testing, commissioning and optimisation.

Key Activity	Timing	Description
LNBo Installation	May-October 2015	Installation of the modified plant and control systems.
Cold testing	September - October 2015	Testing of equipment, instruments and cables before energising. Includes continuity testing of cables, pressure testing, dimensional checking of installed plant, cold setting of limits.
Hot testing	October – November 2015	Testing of any panel, or device where the power supply to the item has been energised. Hot testing proves local functionality of each panel, piece of equipment and instrument.
Dry testing	October – November 2015	Functional testing of devices, groups or systems of devices that have associated protection and trips without the process fluid.
Commissioning	November/December 2015	Commissioning with process fluid (air, oil, coal, water) after all testing is completed, these include: <ul style="list-style-type: none"> ▪ Pre-start-up checks ▪ Firing of oil burners ▪ Boiler safety valve test ▪ Checking group level control, sequences, protection

		<ul style="list-style-type: none"> ▪ Unit synchronisation ▪ Raising load ▪ Full load capability <p>Primarily this is focused around the oil burner system and demonstrating that a large majority of oil burners are available for pressure raising the boiler. Then coal mills and burners are proven with the introduction of coal and running through each of the mills and coal burners to demonstrate each burner sequence to ensure they are all available for optimisation.</p>
Commercial Return to Service	January 2016	The unit is fully available for generation within the commercial market.
Optimisation	January/February 2016	<p>Carrying out a comprehensive range of tests and varying operational parameters and damper set-up to optimise the boiler for environmental performance and efficiency, including:-</p> <ul style="list-style-type: none"> ▪ Air ingress assessment ▪ Pulverised Fuel (PF) sampling ▪ Temperature, pressure and flow analysis ▪ Dust analysis ▪ Carbon in ash tests ▪ Ash analysis <p>Primarily this is focused around ensuring the Unit can meet the load within the Safe Operating Limits (SOL) that we legally have to comply with for the safety of the plant. Secondary drivers are then to optimise the air staging of the burners for different load / mill configurations / coal types. This will be led by the technology provider supported by RWE combustion engineers with the ultimate goal of achieving full-load and jointly meeting the guarantees of the contract in terms of NOx reduction, whilst having compliant SOL and boiler efficiency.</p>
Guarantee Performance Testing	March/April 2016	Undertaking the contractual performance guarantee tests with the technology provider to demonstrate compliance with the guarantees set out in the design and supply contract.

The modifications provide a further benefit in providing more stable combustion at lower unit loads, therefore, there may be a change in the Stable Export Limit (SEL)/Minimum Start Up and Shut Down Load (MSUL/MSDL). This will be communicated following further tests.

4. Potential Impacts of Commissioning

4.1. Air

The LNBo installation will lead to lower stack gas concentrations of NO_x than current levels, expected to be in the range of 450 to 600mg/Nm³. During the optimisation phase the final emission rate will be verified using the Continuous Emission Monitors and a Quality Assurance Level (QAL) 2 test (recalibration) will be undertaken in March 2016. The emission of Carbon Monoxide will also be assessed during the optimisation phase as there may be a small increase, however, emissions will remain within the normal range. There are not expected to be any other changes to emissions to air from the commissioning activities.

4.2. Water

There is not expected to be any changes in the emissions to water from the commissioning activities.

4.3. Noise

Steam pressure safety valves will require testing during the commissioning phase. These activities will give rise to slightly higher noise levels than those generated during normal operation and it is not possible to actively mitigate the noise generated by these valves. The safety valves are an essential safety device and must be tested. This testing will be timed during the normal working day in order to minimise any potential impact and will be of short duration.

4.4. Visual Impact

There may be a slight increase in visual plume during the period when the unit is started up following it being off although this is not expected to impact upon neighbouring residents.

4.5. Dust

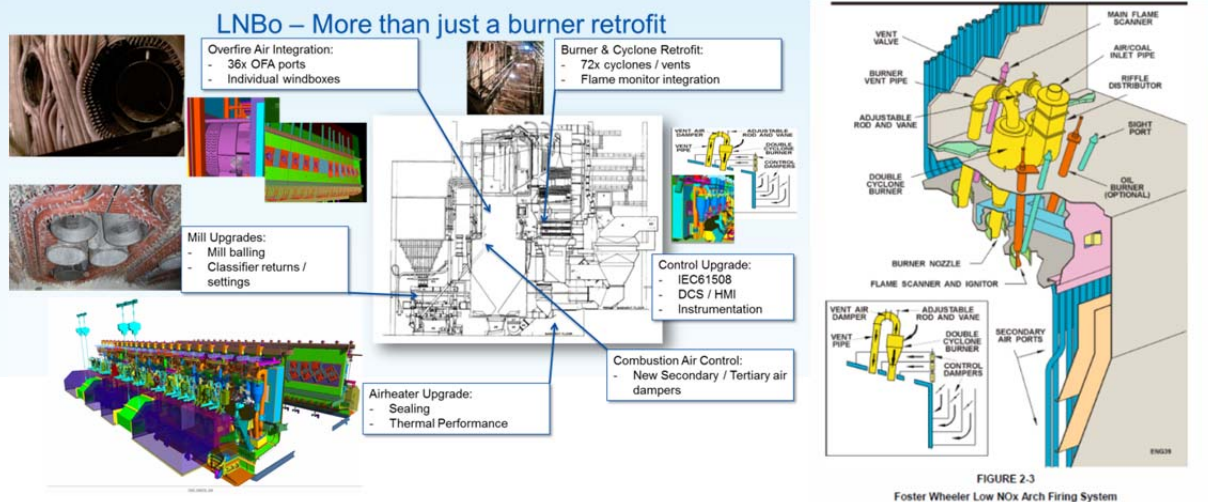
There is not expected to be any increased dust emission from the commissioning activities.

4.6. Odour

There is not expected to be any increased odour from the commissioning activities.

5. Operational Techniques

The LNBo Technology is a hardware based solution which requires the installation of dual cyclone burners as well as changes to boiler/combustion ancillary systems. The technology predominantly reduces Fuel NO_x and also has an effect on Thermal NO_x as peak flame temperature and heat flux are reduced by a longer, staged flame path. The figure and text below summarises the modifications and key changes to operational control.



Air Staging Process

This process will be carried out using the new OFA (Over Fire Air), Cyclone Vent and Secondary Air Modulating Dampers via an fully automated control system which will use Unit Load, Number of Pulverised Fuel (PF) Mills in service and Coal Moisture conditions to determine the necessary damper positions to optimise both Fuel & Thermal NO_x and maximise burnout.

PF Burner Cyclones & Vent Dampers

These will be used to adjust the fuel/air mix by separating Primary Air flow from the fuel source prior to the PF entering the boiler furnace.

Higher Mill Balling Charges

This will improve the current grind capacity of the mill which will help improve the performance of the Primary Air fans and allow the mill dynamic classifier speeds to be increased resulting in lower carbon in ash levels and an overall NO_x reduction.

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