BARRY COGENERATION PLANT

The Environmental Permitting (England & Wales) Regulations 2016

Permit No: EPR/JP3632ZH

IMPROVEMENT PROGRAMME

Reference IC8

Following the commissioning of low NOx burner/FGR conversion of the CHP HP boiler and optimisation of the MP boilers and a period of operation for optimisation of the HP boiler, the Operator shall submit a written post-commissioning report to Natural Resources Wales for approval. The report shall confirm the commissioning completion date for HP boiler conversion to low NOx firing. The report shall also state the emission reductions achieved and relevant performance parameters under the full range of operating scenarios, including, but not limited to:

- *noise levels associated with commissioning activities and routine start up and operation*
- *start up, shut down thresholds*
- *thermal performance*
- *CEMs performance*
- *NOx emissions, including NO:NO2 ratio*
- *CO emissions*

The report shall include confirmation of the Best Available Techniques Associated Emission Levels (BAT AELs) to be adopted upon full optimisation of the HP boiler, including a date from which the BAT AELs will be complied with and 1500 hours/year operating constraints will permanently apply to the MP boilers.

Required Submission Date: 31st December 2022

Written 6th February 2024 by [redacted]

Background

Improvement condition IC8 relates to the operation and emissions of the HP Fired Boiler at the Dow Silicones Cogeneration Plant (CHP). The Large Combustion Directive (LCPD) and Industrial Emissions Directive (IED) introduced lower allowable emissions of NOx (nitrogen oxides). These lower emission limits were introduced into the CHP permit on 30th June 2020.

Schedule 3(a) of the CHP permit provided new NOx limits of 100mg/m^3 (monthly), 110mg/m^3 (daily) and 200mg/m^3 (95th percentile) applicable from 1st July 2020.

Schedule 3(b) – Emissions and monitoring - Table S3.1(a) is effective from the date approved by NRW upon completion of this improvement condition IC8. New NOx limits will then apply as follows: 100mg/m^3 (monthly), 110 mg/m^3 (daily) and 200mg/m^3 (95th percentile).

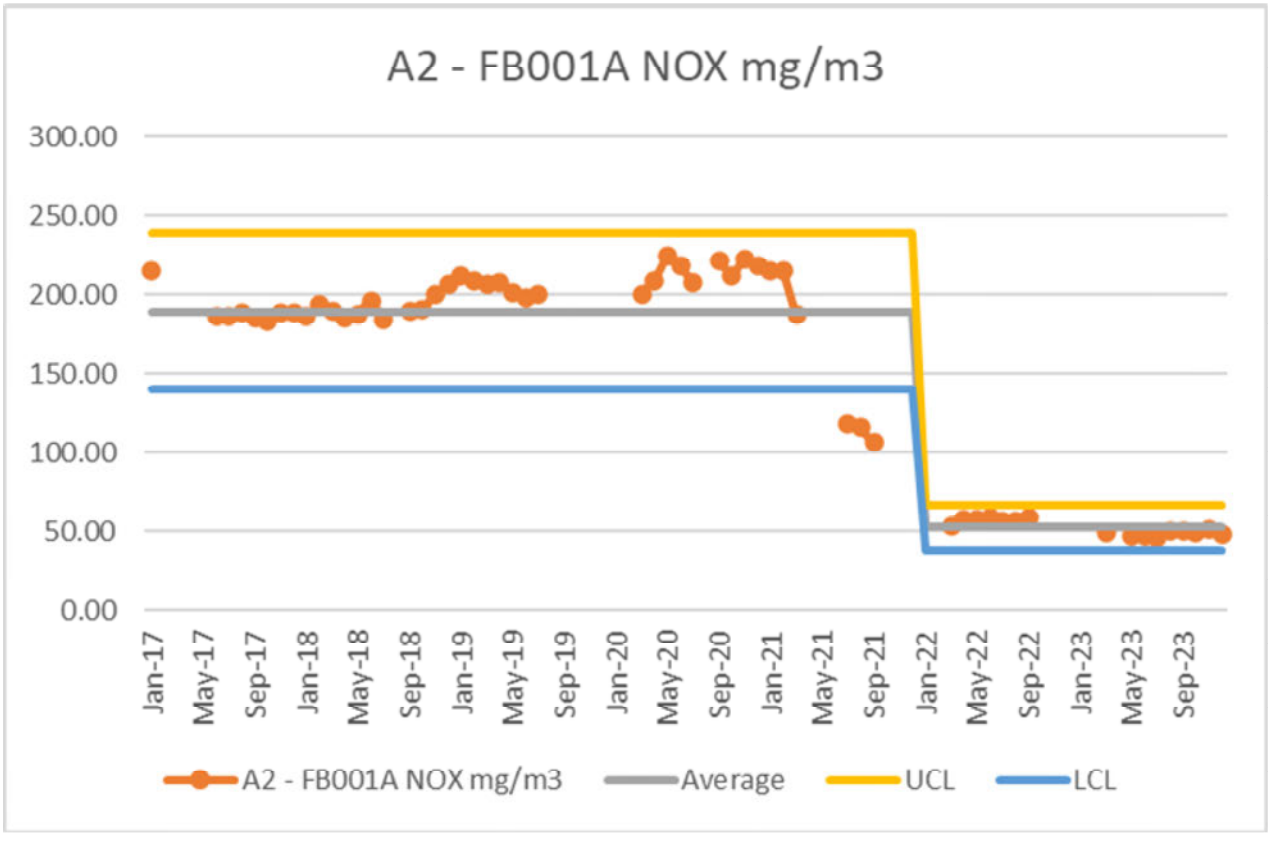
To meet the lower NOx permit requirements involved upgrading the Fired Boiler burners.

The fired boiler was upgraded and commissioned during July 2021, however the boiler needed further work to enable it to run with both burners lit and tuning to further optimise the CO. There was a delay in doing this due to Covid 19, contractor resource availability and boiler availability due to the statutory inspection on HRSG-A. This tuning was carried out early 2022. The boiler was shutdown for statutory inspection in September 2022 and restarted March 2023. We now have a satisfactory amount of data to complete this report.

The following sections provide details of the commissioning and subsequent operational performance post upgrade.

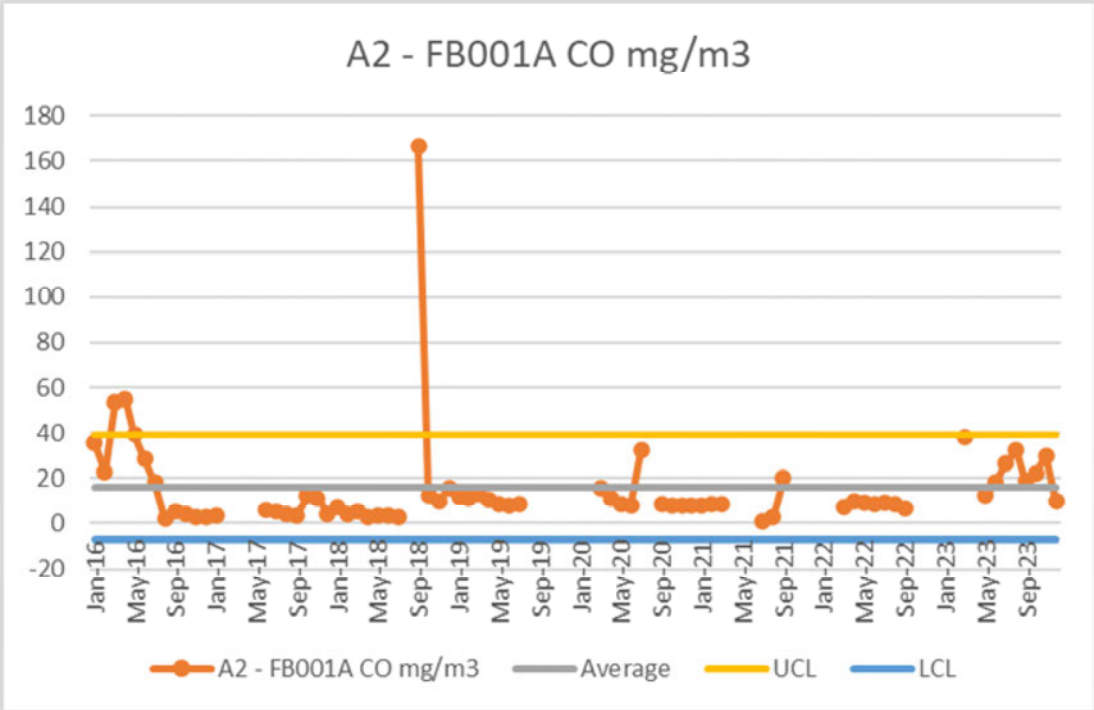
Emission Reduction Levels Achieved

The following graphs show emission levels of NOx and CO before and after for the HP Fired Boiler. Emission results have consistently been below both LCPD and IED schedule 3(a) and 3(b) permit emission values.



		NOx mg/m3 Dry*		
		SPC average	SPC UCL	SPC LCL
A2 (FB)	Before	189.48	239.09	139.87
	After	52.51	66.78	38.23
	Reduction	136.97		

*Corrected to 3% O2.



		CO mg/m3 Dry*		
		SPC average	SPC UCL	SPC LCL
A2 (FB)	Before	14.45	36.03	-7.14
	After	23.04	38.15	7.94
	Reduction	-8.6		

*Corrected to 3% O2.

Analysis of NOx performance showed that NOx levels have dropped significantly with the installation of the low NOx burners. Since the statutory inspection in Q4 2022 the NOx levels have dropped a little lower again, but the CO has increased a little. We do have some further optimisation to carry out regarding NOx vs CO to ensure the CO is controlled as the unit runs harder.

CEMs performance

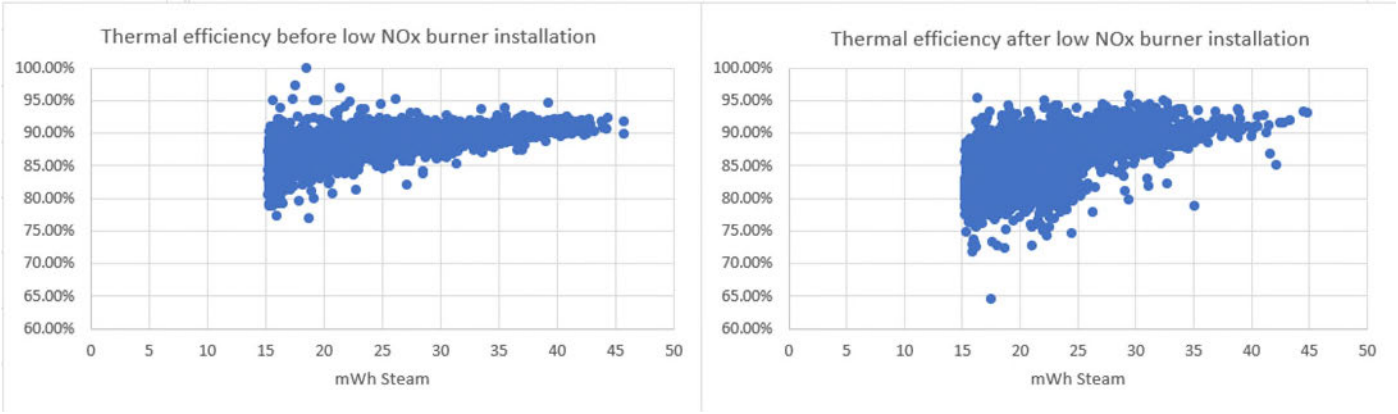
There were no changes to the CEMS monitors as part of the project. Further project work is ongoing now to spec, design and install a new CEMS on this system due to obsolescence and vulnerability of the existing system.

Start up and shutdown thresholds

It is not proposed to change the start up and shutdown thresholds for this unit as the unit still fundamentally operates the same as it did before the change.

Thermal efficiency

The graphs below show the thermal efficiency, calculated using MWh Steam out / MWh Gas in. They show that whilst the profile of the thermal efficiency has slightly altered, there has been no significant increase or decrease in thermal efficiency.



Noise levels associated with commissioning activities and routine start up and operation

The fired boiler is located directly between GTA/HRSG-A and GTB/HRSG-B. During commissioning and throughout 2021 were unable to carry out targeted noise monitoring as either GTA or GTB was operational during this period. This would have given a higher baseline noise and masked any noise specific to operating the fired boiler. There has been no observed increase in localised fenceline noise since the upgrade of this boiler.

Summary and Proposals

The emission results confirm that the Best Available Techniques Associated Emission Levels (BAT AELs) (provided in Schedule 3(b) of the permit) can now be adopted as the units are fully optimised and the BAT AELS can be complied with.