



Shell Chemical Appalachia LLC
300 Frankfort Rd
Monaca, PA 15061

March 9, 2022

Mark Gorog P.E., Regional Manager Air Quality
Program Pennsylvania Department of Environmental
Protection Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222

RE: PA-04-00740C Source IDs 101, 102, 103 Combustion Turbine/Duct Burner Units #1, #2, #3 NO_x Emissions Malfunctions Final (Follow Up) Report, January 1 through February 4, 2022

Dear Mr. Gorog,

Shell Chemical Appalachia LLC (“Shell”) is submitting this final (follow up) incident report for all elevated NO_x emission incidents that occurred between January 1 and February 4, 2022, and that have been reported under separate initial letters to the Pennsylvania Department of Environmental Protection (PADEP). This final report summarizes and groups all incidents’ determined causes and corrective actions from the completed investigation. Note eight of nine incidents occurred prior to Shell’s Continuous Emissions Monitoring System (CEMS) certification.

- **Name and location of the facility**
Shell Polymers Monaca
300 Frankfort Road, Monaca PA, 15061

- **Summary and attributed causes**
A total of 9 incidents (excluding startups and shutdowns) resulting in elevated NO_x emissions indicated by the CEMS were observed and reported.¹ These incidents have been grouped into three primary categories and sub-categories below.

¹ Of these events, 8 were observed from data collected prior to completing all the CEMS certification testing steps for the Cogen Unit.

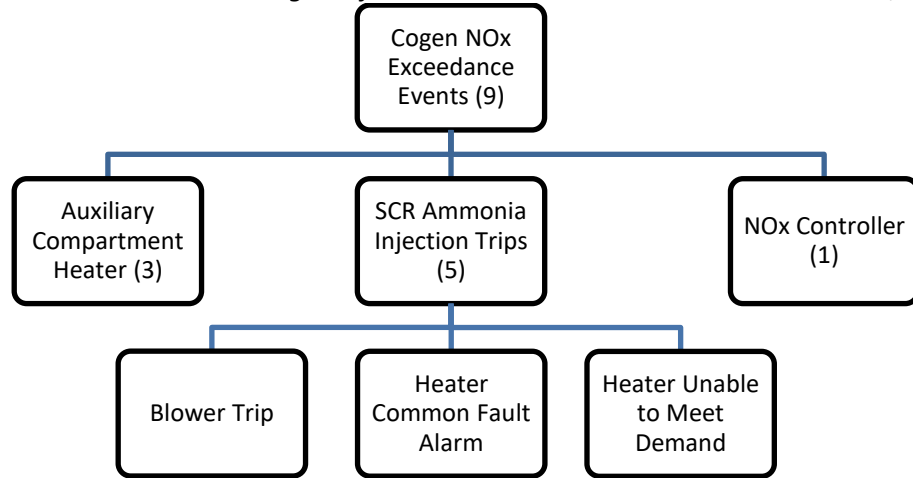


Table 1 provides a line-item connection of the cause attributed or determined for each incident, time, duration, and Source previously reported.

Table 1: Previously Reported Elevated NOx Emissions with Cause

Date	Begin Time	Duration (hr)	Source	Excess Emissions (lbs)	Cause
Jan 1	10:30 PM	1	102 (Unit #2)	6.7	SCR ^a Air Heater
Jan 4	9:10 AM	4	102 (Unit #2)	444.8	Aux Comp Heater
Jan 14	8:00 AM	1 ^b	103 (Unit #3)	1	NOx Controller
Jan 14	10:30 AM	3	102 (Unit #2)	14.4	SCR Air Heater
Jan 16	10:00 AM	1	102 (Unit #2)	27.3	Aux Comp Heater
Jan 20	11:00 AM	4	102 (Unit #2)	30	SCR Air Heater
Jan 22	2:00 PM	2	102 (Unit #2)	19.6	Aux Comp Heater
Jan 26	8:00 AM	3	101 (Unit #1)	12.5	SCR Air Blower
Feb 4	12:00 PM	3	102 (Unit #2)	20.3	SCR Air Heater

^a – Selective catalytic reduction

^b – This 1-hr NOx rate was 2.05 ppmvd @ 15% O2 and rounds to 2 following rounding methodology

• **Causes and corrective actions**

Cause 1 (Auxiliary Compartment Heater) – Heaters located in the gas turbine generator auxiliary compartment were found to have been set to activate at -4°F. In January, compartment temperatures fell below freezing and the compressor discharge pressure indicators experienced freezing. This resulted in trips of the turbine into lean-lean combustion mode with elevated NOx emissions.

Cause 1 Corrective Actions – Pressure taps were blown down and thawed out. Heater set points were elevated to activate at 40°F and prevent freezing.

Cause 2 (SCR Air Blower) – Blowers (1 primary and 1 spare) providing air to the ammonia injection system are drawing more amps than intended. These blowers are interlocked with the ammonia injection system such that if a blower trips offline the ammonia injection also trips offline. This resulted in elevated NOx emissions in the event of a single blower trip.

Cause 2 Corrective Action – A 20 second lag was added to the ammonia injection interlock to allow the spare blower time to activate as designed and prevent an ammonia injection system trip.

Cause 3 (SCR Air Heater) – Heaters (1 primary and 1 spare) heating the blower air prior to mixing with ammonia in the ammonia vaporizer vessel were being run outside of their design windows. Excessive operation of the heaters to meet the setpoint of the vaporizer exceeded the heater sheath temperature limits. These heaters are interlocked with the ammonia injection system such that if a heater trips offline the ammonia injection also trips offline. This resulted in elevated NOx emissions in the event of a heater trip.

Cause 3 Corrective Actions – Additional instruction has been provided to operations to adjust air flow to heaters as needed to meet needed vaporizer temperatures. Heater design information has been gathered and correctly stored for operations reference. High temperature alarm is being added to the heater sheath temperature to provide advanced notification to the operator before a heater trip. Alarms are being added to heater parameters (air input flow, and output heat) around design values.

Cause 4 (NOx Controller) – NOx controllers automatically adjust and manage the SCR control system to maintain NOx at a setpoint below the permit limit. This controller is sensitive to external influences including analyzer calibration. An unexpectedly low NOx value was held by the controller during the daily calibration which reduced ammonia injection and elevated actual NOx emissions for a short time.

Cause 4 Corrective Actions – Additional instruction has been provided to operations to manually control NOx and ammonia injection as needed during scheduled daily NOx analyzer calibration and other analyzer maintenance times to avoid high NOx. NOx setpoints have been adjusted to control to oxygen-corrected vs. raw values and provide greater consistency between operational control and permit limits. NOx setpoints have been lowered to give operations additional time to react to high NOx while still avoiding excess ammonia slip.

Shell continues to look for and identify opportunities to improve long term system reliability and performance of the SCR controls, combustion turbines, and duct burners. Additional improvements and changes may be implemented as operating time and experience increase and normal operation is achieved for the facility.

If you have any questions regarding this matter, please contact me at (724) 709-2467 or kimberly.kaal@shell.com.

Sincerely,

Kimberly Kaal

Kimberly Kaal

Mark Gorog
Environmental Manager, Attorney-in-Fact

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CC:

Scott Beudway, Air Quality Specialist
Anna Fabrizi, District Supervisor