

JEA Brandy Branch Combined Cycle Units NOx Catalyst Replacement Scope

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Introduction & Background

The Brandy Branch Generating Station includes a 2x1 Combined Cycle power block that consists of two GE frame 7FA model 7341 .05 gas turbines, two Nooter-Eriksen heat recovery boilers, one GE D-11 steam turbine, and BOP equipment. The site also has a third 7FA gas turbine in simple cycle.

Units 2 & 3 combustion turbines exhaust their byproduct heat into their associated Heat Recovery Steam Generators (HRSG) for steam production for the Unit 4 steam turbine. Within the HRSG, between the HP and IP reheat sections, is a section dedicated to emissions control. Part of this section contains a Peerless Selective Catalytic Reduction (SCR) catalyst, a honeycomb-like structure where NOx with ammonia grid reacts with the catalyst and effectively reduces NOx emissions to levels acceptable by EPA standards and permits. Cormetech manufactured the ceramic base metal oxide catalyst which uses 19% aqueous ammonia for the reduction reaction.

A. PERFORMANCE at Design Conditions

Parameter	Units	Value
Max Exhaust Flow	lb / hr	4,300,000
Maximum Duct Burner Fuel flow	scfh	80,000
SCR Operating Temperature	°F	567 - 661
SCR Inlet NOx	ppmvdc	6 - 9
SCR Inlet CO ¹	ppmvdc	3 - 8 normal
Stack CO Limit	ppmvdc	14
Stack NOx Limit	ppmvdc	3.5
Ammonia Slip Limit	ppmvdc	5

Notes:

1. SCR Inlet CO is higher when operating at low loads.

B. SITE CONDITIONS

- Site location: 15701 West Beaver Street, Baldwin, FL 32234
- Equipment: Location Outdoor
- Ambient temperature range 7° to 105°F
- Site Elevation 88 feet

C. SCOPE OF WORK

1. Work by Contractor.

A. Design new catalyst.

1. Confirmation of dimensions for installation of new catalyst.
2. Provide Owner with project costs for the following:
 - Base bid: replacement-in-kind
 - Bid Option 1: Low pressure drop design (pleated or staggered)
 - Bid Option 2: Low pressure drop design and dual-catalyst
 - Appendix A provides the bid form for these options

B. Remove existing catalyst.

1. Outage is scheduled for March 8, 2027 to April 22, 2027.
2. Removal, disposal, and installation by the contractor shall include the safe and proper use and mobilization of equipment or machinery such as cranes, lifting beams, spreader bars, special slings and cables, forklifts, scaffolding and welders that are needed for the work to be done.
3. Proper skilled and trained laborers and operators will be provided by the contractor.
4. Disposal of existing catalyst. The contractor must also comply with any regulations regarding safe and environmentally-sound disposal of waste materials.

C. Procure and Install new catalyst.

1. Two samples of each catalyst shall be provided before shipping the catalyst to the job site. One sample will be placed in on-site storage. The other sample shall be tested by the Seller to ensure the catalyst meets specifications. Test results shall be presented to JEA before shipment of the catalyst.
2. Procure new catalyst including shipping and on-site storage.
3. Install new catalyst per OEM recommendations. Develop and confirm quality assurance during the installation.
4. Ensure minimal leakage by verifying all seals. Replace all bolts as required. Replace gasket seal at roof top panel.
5. Each catalyst bed shall be equipped with provisions for periodic catalyst sampling. If removable catalyst sections are used to meet sampling requirements, one complete set of spare catalyst sample blocks shall be provided.
6. Pre-shipment submittals: Performance Correction Curves
 - a. NO_x/CO conversion versus temperature
 - b. Ammonia slip versus temperature.
 - c. Ammonia slip as a function of inlet NO_x and NH₃ injection rate.
 - d. SO₂ to SO₃ conversion versus temperature.
 - e. Formation of ammonia sulfur compounds versus SO₃ concentration upstream of the AIG and temperature assuming constant NH₃ slip.
 - f. Estimated removal efficiencies for Non-Methane and Non-Ethane Hydrocarbons versus temperature.
 - g. NO_x/CO Conversion versus hours of operation.

D. Project Completion

1. Contractor shall conduct AIG tuning and performance testing to demonstrate all guarantees are satisfied. Seller shall supply, at no cost to the Buyer, personnel to witness performance testing of the catalyst, if desired by JEA.

E. Submittals

1. One electronic copy of all documents
 - i. AutoCAD and PDF all drawings
2. Two bound manuals of all documents.
 - a. Operations and Maintenance Manual including start up procedures.
 - b. Recommended spare parts.
 - c. Written description of the removal and installation procedure and sampling procedure.

F. Manufacturing Requirements

1. All equipment supplied by the Seller shall be manufactured in one complete assembly or in sub-assemblies. All assemblies shall be designed and manufactured to enable the largest pieces possible to be shipped to the plant site.
 2. All equipment shall be designed and constructed to minimize field welding. Where field welding is required, all joints shall be prepared for welding before shipment.
 3. Preparation for shipment. During in-transit time and while pending assembly, the catalyst components will be subject to outdoor exposure in a wide range of ambient conditions. All items shall be preserved, sealed, and packed adequately to keep moisture, dirt and other contaminants out for a minimum of 6 months of field storage and with a preservation durability of one year preferred.
 4. Nameplate. A permanently attached corrosion resistant nameplate shall be affixed at a prominent location on the catalyst housing and shall include the following information as a minimum:
 - i. Name of Manufacturer
 - ii. Equipment Type / Name
 - iii. Manufacturer Model No.
 - iv. JEA Purchase Order No.
 - v. Design Removal Efficiency
2. Work Performed by JEA
- a. Supply of temporary electric power and auxiliary air if needed.
 - b. Lock out tag out of affected systems.
 - c. I&C support for any instrumentation that may need to be temporarily removed from the site during removal and installation.
 - d. Identification of plant laydown area.

G. DRAWING REFERENCES:

SCR Catalyst Module
Internal Structure General Arrangement
SCR Assembly Diagram
Spool Duct Casing Ass'y Diagram
Catalyst Support Structure GA
Roof Liner Layout

SCR Cat 201A008.pdf
SCR Cat 541M004.pdf
SCR Assembly 201A122.pdf
SCR Spool Duct 201A120.pdf
Cat Support 541M006.pdf
HRSG Roof Liner Layout 201A063.pdf



Cat Support
541M006.pdf



SCR Cat
201A008.pdf



SCR Cat
541M004.pdf



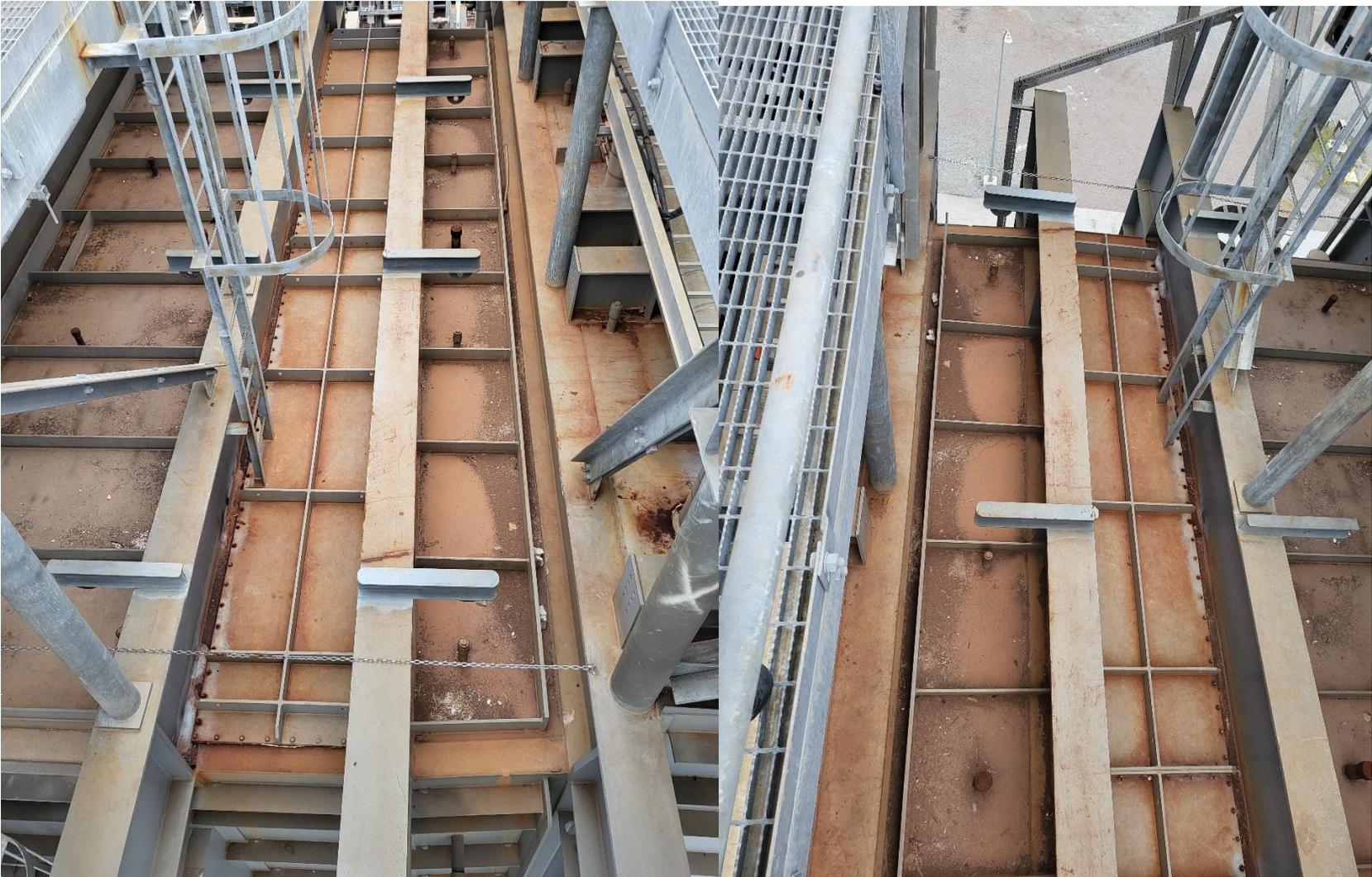
SCR Assembly
201A122.pdf



SCR Spool Duct
201A120.pdf



HRSG Roof Liner
Layout 201A063.pdf



Roof access panel. Replace all fasteners on roof access panel



Appendix A

Catalyst Bid Form: Performance Guarantees

Proposal Description		Base Bid	Low dP	Low dP and CO
NOx Conversion Rate	%			
CO Conversion Rate	%			
Ammonia Slip	ppm			
Catalyst Differential Pressure	in H ₂ O			
Catalyst Activity	%			
Catalyst Activity / Functional Service Life (KO / KE)	%			
Catalyst Life, years	years			
Mechanical Service Life of the Catalyst	years			
NH ₃ Consumption	lb / hr			

Project Costs

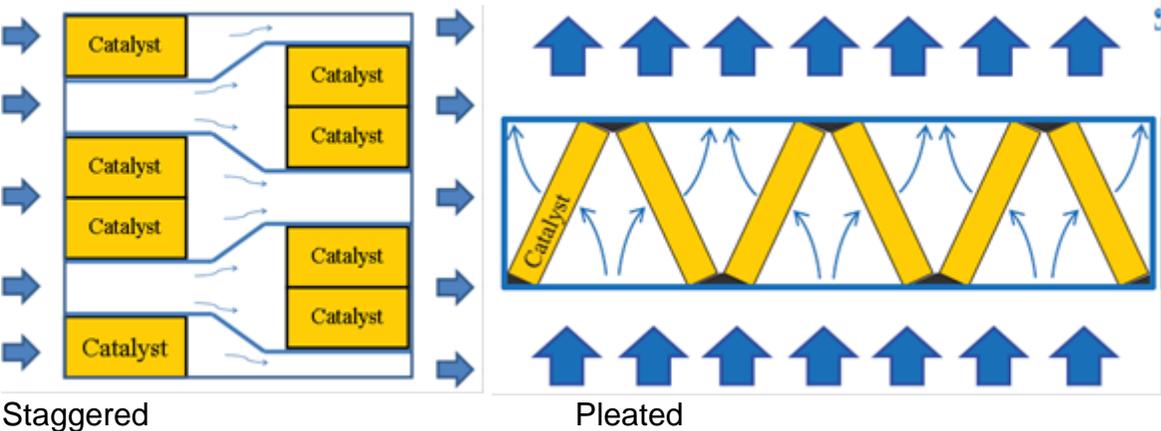
		Base Bid	Low dP	Low dP and CO
Removal and Installation of New Catalyst	\$			
Supply & Deliver Catalyst Only	\$			
Total Project Cost	\$			

Base bid: Replacement in kind. Not staggered or pleated configuration.
 Low dP: Pleated or staggered configuration.
 Low dP and CO: Pleated or staggered configuration plus dual catalyst.

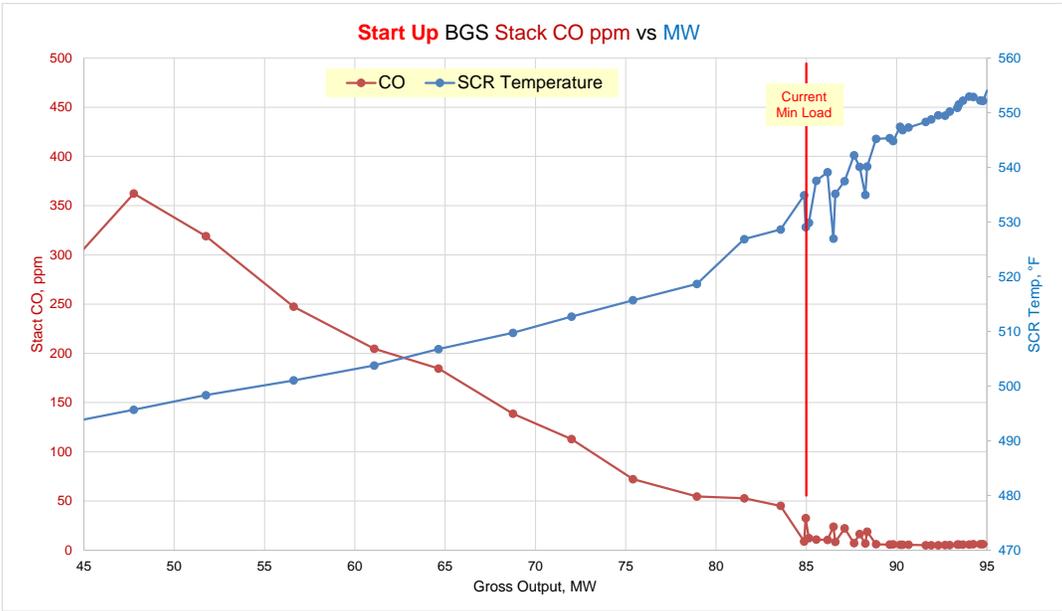
Guarantees established by bidders.

Appendix B: Supplemental Data

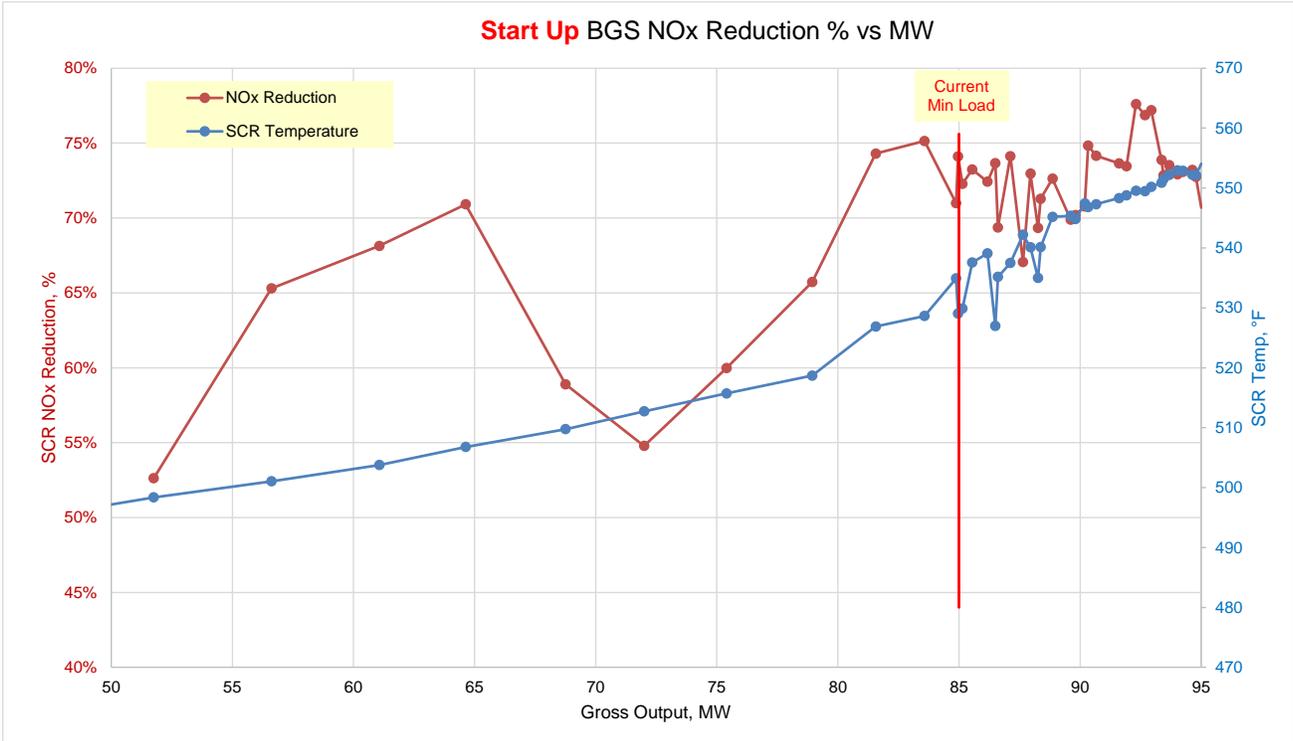
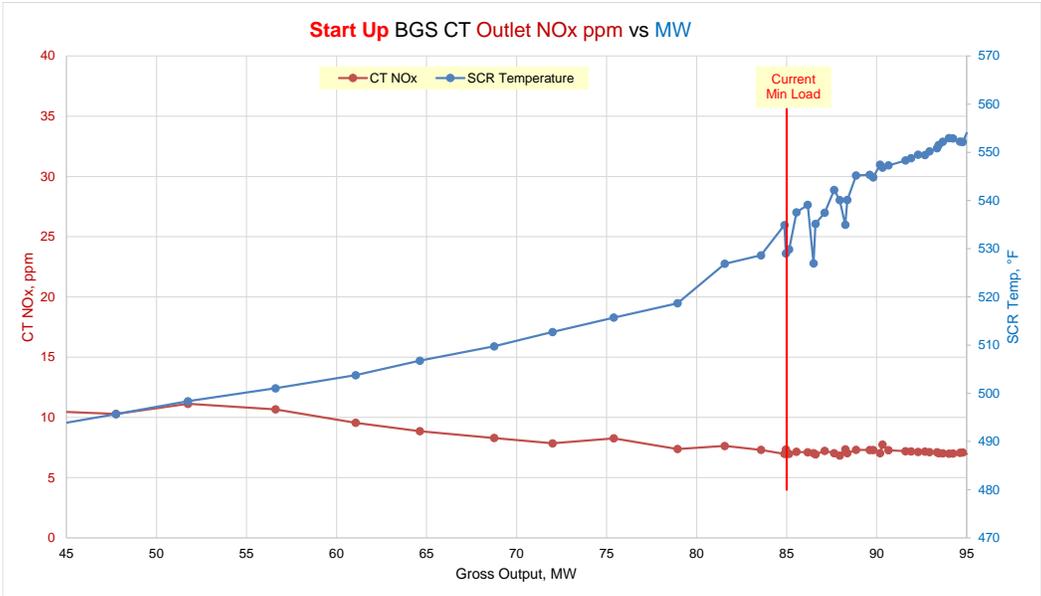
Pleated vs Staggered Catalyst. The motivation for a pleated or staggered catalyst is driven from the desire to reduce the gas side pressure drop which results in an efficiency improvement. Graphically, the configuration is shown below:



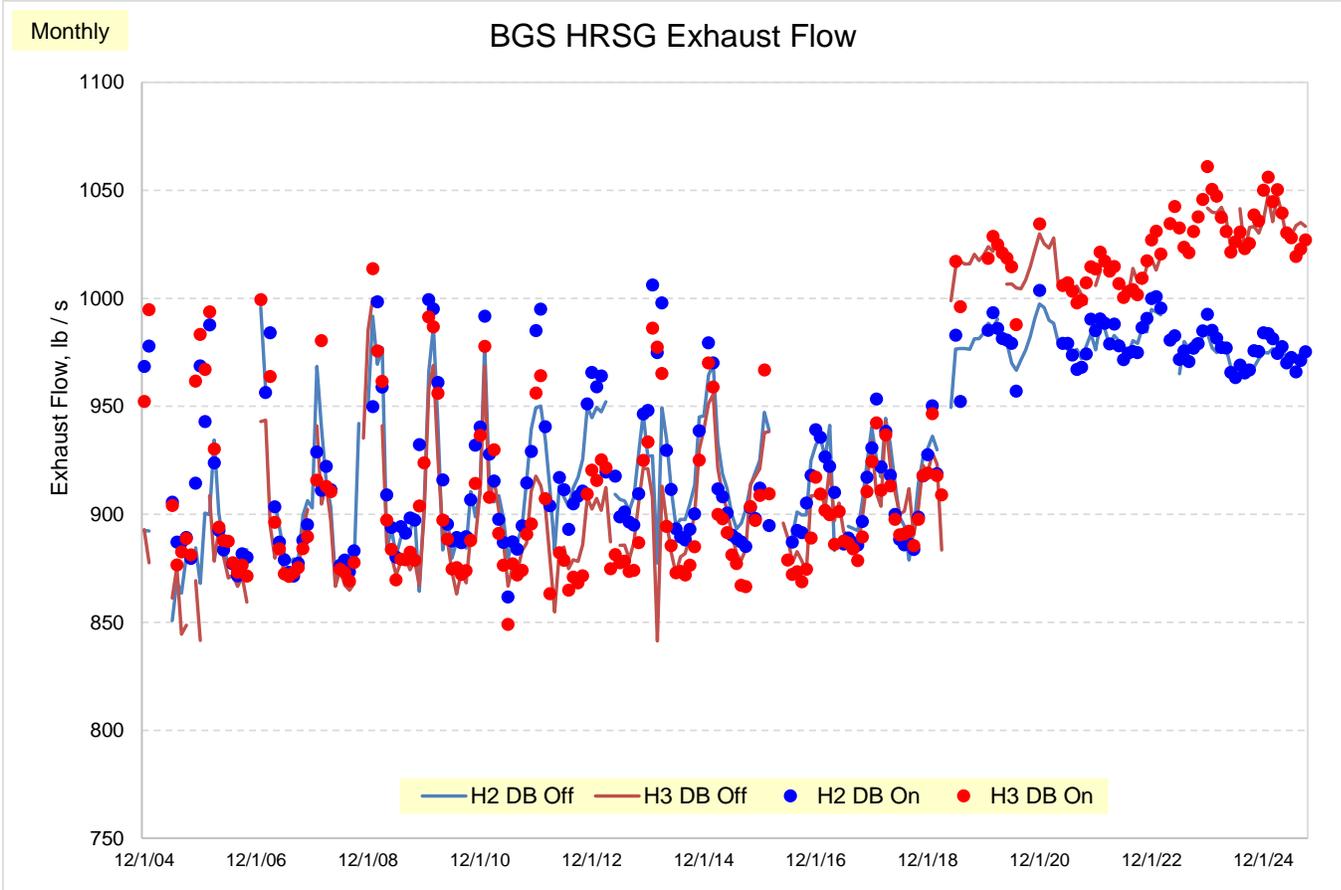
Dual Catalyst. The current CT min load is 85 MW. Potentially, a future CT upgrade would lower this minimum load by achieving lower emission levels sooner. Additionally, it is expected in the future, it will be desirable to operate the units at lower loads. Dual catalyst would provide additional CO reduction. Current operational data is shown in the following:



BGS Catalyst Replacement Scope



During normal operation after start up, the NOx reduction has been 65-75%.



2019 was the upgrade to .05.