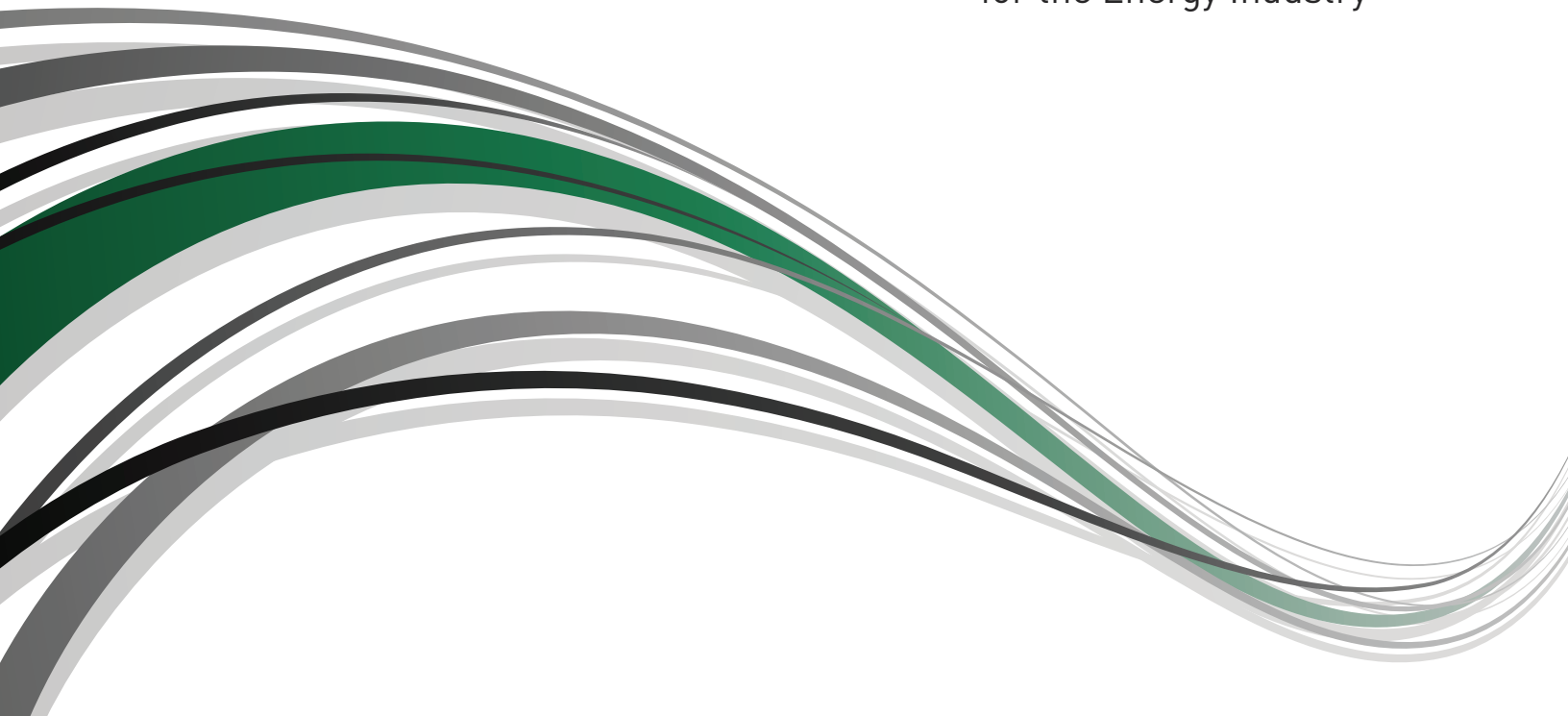




**BREEN**®

SMART SCIENCE • CLEANER ENERGY

Technology + Services  
for the Energy Industry



## INTRODUCTION

Breen Energy Solutions (BES) provides technology and services to the Fossil Fuel Power Generation Industry that helps utilities manage their emissions and the Balance-Of-Plant (BOP) impacts resulting from their emissions control technologies.

Over the last six years, BES has commercialized several technologies in the Acid Gas Management field including the AbSensor - SO<sub>3</sub>/AbS measurement system, the Breen Online Air Heater Model and the Dynamic Speed Controlled (DySC) Air Heater Sootblowing technology. BES also provides Dry Sorbent Injection (DSI) systems for SO<sub>3</sub> mitigation using Lime, Trona and other dry Sorbents as well as a wet sorbent injection process for the injection of Magnesium Oxide for slag control and SO<sub>3</sub> mitigation.

During this time, BES has formed relationships and technology licensing arrangements with EPRI, Duke Energy, Lubrizol and Headwaters Resources.



# BREEN HAS DEVELOPED A SET OF ADVANCED TECHNOLOGIES TO HELP MANAGE SO<sub>3</sub> RELATED BALANCE-OF-PLANT IMPACTS (BOP).

## Acid Gas Measurement and Management

BES has developed the only real-time measurement device, AbSensor-SO<sub>3</sub>/AbS, in the industry that can measure SO<sub>3</sub> concentrations in the flue gas in-situ and in real-time. With over 100 permanent installations of this technology, many in closed loop control, this is considered as the defacto Industry standard in condensables measurement technology. This system can also measure the condensation of Ammonium Bisulfate (AbS), a product of Ammonia Slip and SO<sub>3</sub>, which is used for closed loop control of SCR/SNCR injection rates and Air Heater outlet temperature control for the specific purpose of Air Heater fouling mitigation.

BES has licensed EPRI's Air Heater model for rotating Air Heaters and has developed an online Air Heater model execution software that can predict, in real-time, where in the Air Heater the fouling material, be it SO<sub>3</sub> or AbS, is condensing. This is then fed into a Targeted Deposition Depth (TDD) controller that can adjust reagent injection or Air Heater temperature to keep the fouling material within the cold-end of the Air Heater.

Once the fouling material has been contained within the cold-end of the Air Heater by utilizing the AbSensor measurement, the online Air Heater model and the TDD controller, it is now necessary to keep the cold-end clean so as to avoid ID Fan related derates and forced outages.



Air Heater fouling in the cold end is a result of higher tangential velocities at the outermost edge of the Air Heater, which are approximately 5 to 10 times that at the innermost edge, leading to limited penetration of the sootblower media. Or in other words, the sootblower media penetration and therefore its ability to clean reduces as the sootblower moves from the innermost diameter of the Air Heater to the outermost diameter of the Air Heater. Based on this and in conjunction with Duke Energy, BES has developed a patented technology that adds VFDs to the AH motors and controls the AH rotational speed in conjunction with the sootblower motion from inside to outside thereby maintaining the same tangential velocity and therefore the same media penetration. This technology is commercialized as the Dynamic Speed Controlled (DySC) Air Heater Sootblower technology and includes triple redundant motor controls, dual redundant speed feedback and dual redundant PLC.

BES also provides SO<sub>2</sub>/AbS profiling services to help utilities understand the BOP impacts of Acid Gas and emissions control technologies.

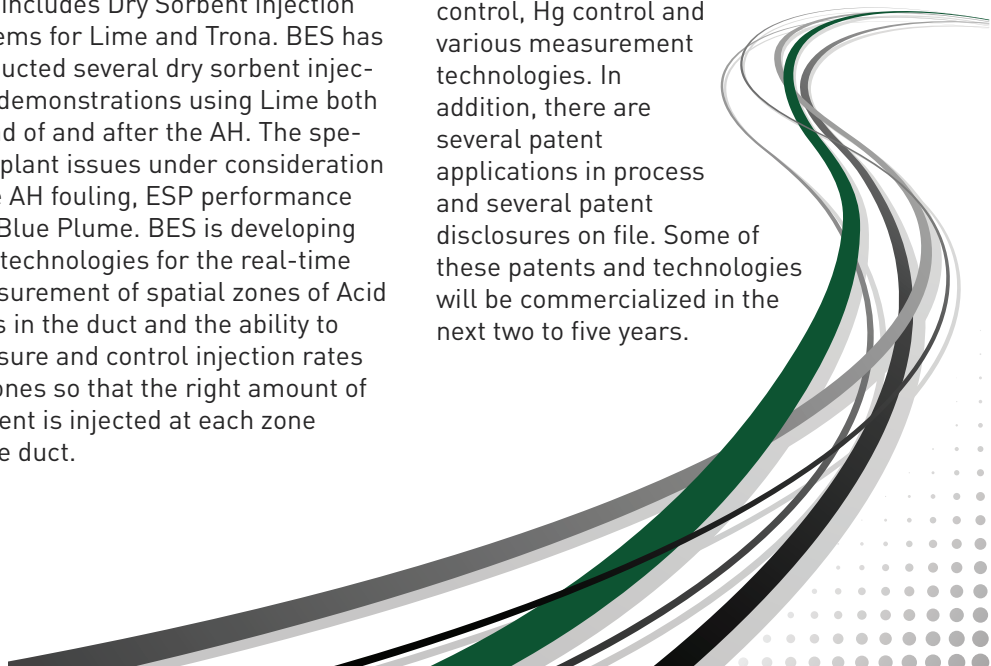
#### **Sorbent Injection Technologies**

In a continuation of expansion within this field of expertise, BES now also provides equipment and services related to the injection of Dry and Wet Sorbent materials for the management of SO<sub>2</sub> and other Acid Gases. This includes Dry Sorbent injection systems for Lime and Trona. BES has conducted several dry sorbent injection demonstrations using Lime both ahead of and after the AH. The specific plant issues under consideration were AH fouling, ESP performance and Blue Plume. BES is developing new technologies for the real-time measurement of spatial zones of Acid Mass in the duct and the ability to measure and control injection rates by zones so that the right amount of sorbent is injected at each zone in the duct.

BES has formed an exclusive relationship with Lubrizol to develop and market an MgO liquid sorbent injection technology for the mitigation of back pass slagging and the reduction of Boiler generated SO<sub>2</sub>. Several full scale demonstrations have been conducted.

#### **Other technologies**

BES is the owner of or has the rights to twelve patents in the field of NO<sub>x</sub> control, Hg control and various measurement technologies. In addition, there are several patent applications in process and several patent disclosures on file. Some of these patents and technologies will be commercialized in the next two to five years.





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## **APPLICATIONS:**

- Blue Plume Mitigation and Control
- Dry Sorbent Injection for SO<sub>3</sub> mitigation
- Ammonia Slip Mitigation and Control
- Air Heater Fouling Mitigation and Control
- SO<sub>3</sub> Measurement and Control
- Sulfur Condensables (SO<sub>3</sub>) testing services
- Air Heater Sootblower Controls (Dynamic Speed Controlled - DySC)
- Heat Rate Improvement system
- Magnesium Oxide injection for Slag Control
- SCR/SNCR Tuning and Optimization