



### Improved Combustion Control Leads to a Reduction in NOx Emissions

Electric Power Research Institute (EPRI) Project at TVA Kingston Unit #9

Boiler Description: 200 MW CE Tangential, Twin Furnace, Coal Fired, Built in 1955

In March 1996, EPRI sponsored a demonstration project to showcase the potential for reducing NOx emissions by improving combustion control without the use of SOFA or Low-NOx burners. The project scope included the installation of Beck Drives on the windbox dampers, burner tilts, coal mill dampers, fan dampers and boiler feed pump fluid couplings. A Foxboro IA DCS and Rosemount sensors were also installed. TVA/EPRI is convinced that the accuracy and repeatability of the Beck drives has allowed them to maximize NOx reduction and improve boiler efficiency.

Prior to those upgrades, the NOx base line was 0.6 - 0.7 lbs/million BTU. One month after the upgrade, the NOx level was reduced to 0.45 lbs/million BTU.

<u>Area of Improvement</u>	<u>Improvement due to Actuator &amp; Field Instrumentation Upgrades</u>	<u>Annual Savings</u>
Boiler Efficiency	55% of a 1.47% Heat Rate Reduction	\$134,700
Steam Temperature	60% of a 20 BTU Increase	\$23,150
Lower Turndown	50% of a 100 MW to 60 MW Reduction	\$50,000
Boiler Thermal Cycling	60% of Tube Failure Outages – Reduction of 1/Year	\$9,000
Reduced LOI	70% of a 3% Improvement	\$28,000
Conserve Ash Pond Use	55% of a 5 Ton / Day Reduction	\$10,900
Reduced Oil Consumption	85% of 20,000 Gallon / Year Reduction	\$12,750
Faster Start-Up	27% of 2 Hours / Start-Up Savings – 4/Year	\$10,000
Station Service	95% of a 25 BTU Improvement	\$45,800
Exit Gas Loses	55% of a 30 BTU Improvement	\$31,830
NOx Reduction	55% of .25 lbs/MM BTU Reduction	\$63,680
Improved AGC*	25% of a 1 MW/Min. to 3 MW/Min. Improvement	

\*Automatic Generation Control

**Total Annual Savings: \$411,410**

2/3 (67%) of the savings listed above were credited to the Beck Drives:

Annual Savings with Beck Drives: 0.67 x \$411,410 = \$275,644

Investment for Beck Drives (including installation): \$354,710

Annual Savings: \$275,644

**ROI: 1.3 Years or 16-Months**

Rob Frank, Director, EPRI Center @ the Kingston Steam Plant (865-717-2001) can be contacted for additional information.



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