Demonstration of Integrated Optimization Software at the Baldwin Energy Complex

CCPI-1

Emissions Control

Mercury ■ NO_x ■

SO_2 ■ $PM_{2.5}$ ■

Participant
NeuCo, Inc.

Additional Team Members
Dynegy Midwest Generation — host

Location
Baldwin, Randolph County, IL (Dynegy Midwest Generation's Baldwin Energy Complex)

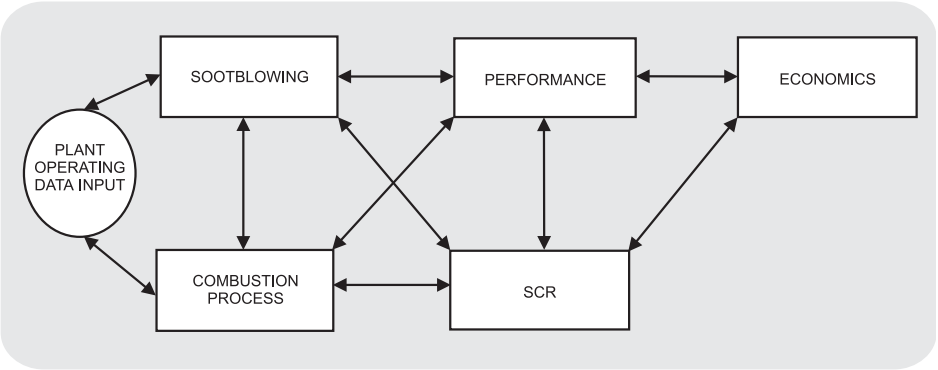
Technology
Advanced optimization software, building on NeuCo's ProcessLink™ technology

Project Capacity/ Production
1,768 MW

Coal
Powder River Basin subbituminous

Project Funding

Total	$19,094,733	100%
DOE	8,592,630	45
Participant	10,502,103	55



Objectives
To design and apply individual on-line optimization modules at the Baldwin Energy Complex for combustion, sootblowing, selective catalytic reduction (SCR) operations, overall unit thermal performance, and plant-wide economic optimization; to link individual optimization modules through NeuCo's ProcessLink™ platform; and to reduce the Baldwin Energy Complex nitrogen oxide (NO_x) emissions by 5 percent, and increase efficiency by 1.5 percentage points and improve reliability and availability, increasing net annual electrical power production by 1.5 percentage points.

Technology/Project Description
This project demonstrates an integrated on-line optimization control system at the Baldwin Energy Complex, incorporating inputs from two 585-MW cyclone-fired boilers with SCR and a 595-MW tangentially fired boiler with low-NO_x burners (LNBs). Optimization modules shall be developed and operated in a non-manual, neural control (closed loop) mode for control of combustion, sootblowing, SCR operations, overall unit thermal performance, and plant-wide economic operation. Modules include software and additional sensors and actuators, as required. These optimization modules are to be integrated through NeuCo's ProcessLink™ architectural platform that includes neural networks, genetic algorithms, and "fuzzy logic" techniques. ProcessLink™ capabilities enable the various optimization techniques at the Baldwin Energy Complex to be linked to each other, leveraging the existing control network. Each module is to be designed, installed, and tested individually to verify effectiveness, before being integrated with the other modules. The system allows collection of data and computations from other networked computers or resources rather than requiring that all data and logic be resident on a single computer. Ultimately, after the optimization modules and associated sensors/controls/actuators are integrated and optimized, the following benefits should result: substantial improvement in enhanced SCR performance for lower NO_x emissions; increased thermal efficiency and reliability for reduced overall emissions per unit of energy reduction; increased power output; and lower costs to consumers.

Benefits
NeuCo's ProcessLink™ architecture offers plant operators a highly flexible control platform. Optimization modules can be designed and applied to individual subsystems in a plant, leveraging existing sensors, actuators and networked

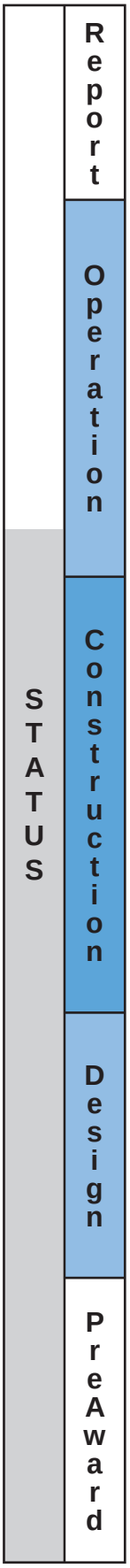
Project Duration 48 Months	Period of Operation 24 Months	Status/Schedule *Estimated date

computational resources, and then linked to other individual subsystems to afford overall integration of controls responsive to plant operator and corporate criteria. As plant complexity increases through retrofit and repowering applications, the introduction of new technologies, and plant modifications, this integrated process optimization approach can be an important tool for plant operators. In this application, upon linkage of five separate optimization modules, improved SCR performance is expected to reduce NO_x emissions by 5 percent while extending SCR catalyst life one year and reducing ammonia consumption by 15 percent. In parallel, Baldwin Energy Complex's thermal efficiency is expected to increase by 1.5 percentage points; and the plant's reliability and availability is expected to improve, increasing net annual electrical power production by 1.5 percentage points, which lowers the cost of electricity. Emissions of carbon dioxide (CO_2), mercury (Hg), sulfur dioxide (SO_2), and particulate matter (PM) are reduced in proportion to the efficiency gain per unit of energy produced.

Status/Accomplishments

The project was selected for award on January 8, 2003. On February 18, 2004, a cooperative agreement was awarded. The National Environmental Policy Act (NEPA) requirements were met with a Categorical Exclusion (CX) at the time of award.

NeuCo designed and installed combustion optimization (CombustionOpt) modules on the two cyclone-fired boilers (Units 1 and 2) and the tangentially fired boiler (Unit 3). NeuCo installed and tested an online ammonia analyzer to monitor ammonia slip in support of the SCR control optimization (as opposed to indirect optimization through combustion controls). Two software packages in support of the sootblowing optimization module (Soot-Opt) were installed on the tangentially fired boiler (Unit 3). Version 2 of ProcessLink™ was installed on Unit 3. NeuCo developed and operated a steam cycle model for the performance optimization module (PerformanceOpt). An integrated version of the real-time PerformanceOpt Complex Boiler Model and the Steam Cycle Model was installed on Units 1 and 2. Work continues on fine tuning the models to improve consistency. NeuCo has submitted its first repayment after the sale of two PerformanceOpt systems.



Final Report Issued	*8/08**
Draft Report Issued	*5/08**
Operation Completed	*2/08**
Operation	*2/06*
Construction	*5/04*
Award	*2/04*
NEPA Completed (CX)	*2/04*
Selection	*1/03*

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