

PROJECT facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
FEDERAL ENERGY TECHNOLOGY CENTER

ADVANCED CLEAN/EFFICIENT
POWER systems

PS015.0697

LOW EMISSION BOILER SYSTEM (LEBS): MORE POWER WITHOUT HIGHER COSTS

PRIMARY PROJECT PARTNERS

**ABB-Combustion
Engineering, Inc.**
Windsor, CT

MAIN SITE

Windsor, CT

TOTAL ESTIMATED COST

\$104,700,000

COST SHARING

DOE	\$56,800,000
Non-DOE	\$47,900,000

Project Description

ABB-Combustion Engineering is leading a team of U.S. companies in designing a highly advanced pulverized-coal-fired boiler system to replace today's aging plants. For several years, the U.S. Department of Energy has sponsored the development and testing of innovative emissions-control technologies, primarily for retrofit to existing boilers. The ABB team is currently integrating these environmental technology advances with state-of-the-art boiler design and highly efficient power-plant construction methods to meet tomorrow's power and environmental demands.

To lower nitrogen oxide (NO_x) emissions, ABB will combine advanced boiler design with major improvements in their tangentially-fired low-NO_x burner system. This system provides for extremely high NO_x reduction in the furnace, which eliminates the need for expensive flue gas control. The design also incorporates coal particle size control to limit the amount of unburned carbon in ash that is often associated with low-NO_x burners. Sulfur dioxide (SO₂) and particulates are effectively removed with ABB's New Integrated Desulfurization (NID) technology, a dry flue gas desulfurization process that offers low cost and high efficiency in a very compact unit.

Very high plant efficiencies—up to 50%—will be reached by incorporating Kalina Cycle technology, which achieves a higher thermodynamic efficiency by using a mixture of ammonia and water, instead of ordinary steam, as its working fluid.

Program Goal

Coal is by far the Nation's most abundant energy resource, but burning coal to generate energy could produce harmful emissions if not controlled. DOE's strategic plan aims not only to ensure a reliable and affordable energy supply for the U.S., but to minimize environmental impact as well. The highly advanced coal-fired Low Emission Boiler System will achieve significantly lower emissions and higher plant efficiencies than conventional units. This system will also deliver electricity at costs no higher than those of current pulverized-coal-fired plants. The success of the program will place our Nation in a strong position to supply power-generation and environmental-control systems to a fast-growing world market.

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CONTACT POINTS

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Project Partners

RICHMOND POWER & LIGHT

Richmond, IN
(host site for proof-of-concept test facility)

RAYTHEON ENGINEERS AND CONSTRUCTORS

Philadelphia, PA
(balance-of-plant design and architect-engineering services)

ABB-ENVIRONMENTAL SYSTEMS, INC.

Birmingham, AL
(emissions control)

Project Benefits

In the near future, the United States will have to build a new generation of coal-based power plants to replace its aging units. Coal supplies more than 56% of the Nation's electricity, and, because of our abundant reserves, it will remain the dominant source of fuel for power generation well into the next century. A national cap on sulfur and NO_x emissions, however, will require future coal technologies to be much cleaner than current technology.

DOE is sponsoring the Low Emission Boiler System program to meet these power and environmental needs. Without significantly departing from the traditional design features of pulverized-coal-firing systems, this technology will:

- Reduce SO₂ and NO_x emissions to a sixth of the levels allowed by today's Federal air quality standards (New Source Performance Standards).
- Lower emissions of flyash and other particulates to a third of those allowed by today's standards.
- Significantly improve power-plant efficiency—up to 50% from today's level of 35%.
- Produce electricity at costs equal to or less than those of a modern-day coal plant.

LEBS is one of several advanced power-generation systems that are being developed with support from DOE. Of these systems, LEBS offers the nearest-term commercial option for utilities to meet the above performance goals for new installations. In addition, many of the technologies that are being developed in the LEBS program will be available for retrofit or repowering applications at existing facilities.

ABB-Combustion Engineering, along with Babcock & Wilcox and DB Riley, are leading teams that are independently developing Low Emission Boiler Systems that incorporate each team's unique, preferred technologies. In late 1997, one of the teams will be selected to construct and operate the proof-of-concept (POC) test facility to provide the engineering data needed for commercialization by the year 2000.

Cost Profile

(Dollars in Millions)

	Prior Investment	FY95	FY96	FY97	Future Funds**
Department of Energy*	\$5.5	\$2.1	\$2.8	\$3.7	\$42.7
Private Sector Partners	\$0.8	\$0.7	\$0.9	\$2.8	\$42.7

* Appropriated Funding

** If ABB is selected to perform POC testing, the final phase of the LEBS development effort, a total of approximately \$90 million (\$45 million DOE) will be required, with \$2.3 million needed in FY97.

Key Milestones

FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99	FY00
Concept development Preliminary R&D Component testing		Subsystem testing Proof-of-concept: facility design Host site selection for proof-of-concept facility		Proof-of-concept facility: revised design Commercial generating unit: revised design		Construction and operation of proof-of-concept facility			