9.0 THE RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

The proposed power plant would occupy about 5 acres of land and consume a variety of natural resources, including coal, natural gas, and groundwater. A water retention pond to support operation of the proposed plant would use about 22 acres of land surface, and additional small areas totaling up to 5 acres of land may be required for monitoring wells, groundwater production wells, and other plant infrastructure-supporting operations. The plant would generate air emissions and solid wastes. However, no off-site surface waters would be used to meet water needs, and water would continue to be recycled for on-site use. Runoff discharges to off-site surface waters would occur only during infrequent occasions when appreciable rainfall events exceed the capacities of pumps designed to retain all water on the site.

The long-term benefit of the proposed LEBS project would be demonstration of an environmentally sound and innovative technology for the utilization of coal. LEBS technology would be expected to achieve appreciably lower emissions and higher electrical generation efficiencies than conventional pulverized-coal fired boilers with conventional flue gas desulfurization controls, while maintaining or lowering overall operating costs and reducing the volume of generated solid waste. The design size for the proposed power plant (91 MW) would be sufficiently large to provide convincing evidence that the technology, once operationally demonstrated at the proposed site in Elkhart, Illinois, could be readily replicated using similar sized or larger combustors, without further scale-up to verify operational or economic performance. Therefore, although the proposed plant would consume resources and generate emissions and solid wastes, the technology to be demonstrated would reduce resource consumption and waste generation in comparison with traditional pulverized coal-fired power generating technologies.

For future commercial installations of the LEBS technology, a reasonable size facility would be about 400 MW. Conventional pulverized-coal boilers used today by electric utilities are predominantly units in the range of 250 to 400 MW. Electric utilities traditionally have installed units of such size and would be expected to continue this practice, which minimizes the capital and operating costs of generating electricity (Charles and Rezaiyan 1997). Scale-up from the proposed 91 MW power plant to a 400 MW facility would be feasible without a larger-scale demonstration. However, a supercritical steam cycle operating at 4,500 psi and 1,100°F could be used with a 400 MW commercial version of the technology to further enhance operating efficiency; supercritical steam turbines are not available below a size of about 100 MW. In addition, a moving-bed, *copper-oxide sorption system* for SO_2 capture could be used in a commercial-scale LEBS facility; this technology is not yet sufficiently mature for use in the proposed demonstration project.

A 400 MW commercial version of the LEBS technology would be expected to reduce SO_2 emissions to 0.1 lb/MM Btu, which is one-twelfth of the current New Source Performance Standard of 1.2 lb/MM Btu. The rate of NO_x emissions would be expected to be approximately 0.1 lb/MM Btu, which is one-fifth and one-sixth, respectively, of the New Source Performance Standards of

0.5 lb/MM Btu for subbituminous coal and 0.6 lb/MM Btu for bituminous coal and anthracite. The technology would lower emissions of fly ash and other particulate matter to 0.01 lb/MM Btu, which is one-third of the allowable New Source Performance Standard of 0.03 lb/MM Btu.

A 400 MW version of the LEBS technology would also be expected to improve electrical generation efficiency to as high as 42% from the current level of about 35%. A low-temperature heat-recovery system, in which the flue gas temperature is lowered by transferring heat to combustion air and feedwater, would contribute to the higher efficiency. The supercritical steam cycle that could be used with a 400 MW commercial version of the technology would provide an even greater efficiency, which would reduce the quantity of coal needed to generate a given amount of electricity and, consequently, result in less emissions of CO_2 compared with conventional coal-fired facilities. The cost of electricity from LEBS technology would be expected to be about 10% less than the cost of electricity from a conventional coal-fired power plant.