DOE/EA-1472

ENVIRONMENTAL ASSESSMENT

Commercial Demonstration of the Low NOx Burner/Separated Over-Fire Air (LNB/SOFA) Integration System Emission Reduction Technology

HOLCOMB STATION
SUNFLOWER ELECTRIC POWER CORPORATION
FINNEY COUNTY, KANSAS

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TABLE OF CONTENTS

TABLES

APPENDICES

APPENDIX A: *Figures*

APPENDIX B: *Draft Environmental Assessment Distribution List*

APPENDIX C: *Correspondence received on Draft Environmental Assessment*

SUMMARY

The U.S. Department of Energy (DOE) proposes to provide partial funding to the Sunflower Electric Power Corporation (Sunflower), to demonstrate the commercial application of Low-NO_X Burner/Separated Over-Fire Air (LNB/SOFA) integration system to achieve NO_X emission reduction to the level of 0.15 to 0.22 pounds per million British thermal units (lb/MM Btu). The proposed project station is Sunflower's 360 MW coal-fired generation station, Holcomb Unit No. 1 (Holcomb Station). The station, fueled by coal from Wyoming's Powder River Basin, is located near Garden City, in Finney County, Kansas. The period of performance is expected to last approximately 2 years.

The Holcomb Station, Sunflower LNB/SOFA integrated system would be modified in three distinct phases to demonstrate the synergistic effect of layering NO_x control technologies. Once modified, the station would demonstrate that a unit equipped with an existing low-NO_X burner system can be retrofitted with a new separated over-fire air (SOFA) system, coal flow measurement and control, and enhanced combustion monitoring to achieve about 45 percent reduction in nitrogen oxides (NO_x) emissions.

The proposed project would demonstrate a technology alternative to Selective Catalytic Reduction (SCR) systems. While SCR does generally achieve high reductions in NO_x emissions (from about 0.8 lb/MM to 0.12 lb/MM Btu), it does so at higher capital and operating cost, requires the extensive use of critical construction labor, requires longer periods of unit outage for deployment, and generally requires longer periods of time to complete shakedown and full-scale operation. Cost of the proposed project technology would be on the order of 15-25 percent of that for SCR, with consequential benefits derived from reductions in construction manpower requirements and periods of power outages. This proposed technology demonstration would generally be applicable to boilers using opposed-wall burners firing sub-bituminous coal from Wyoming's Powder River Basin, of which there are approximately 90 units in the existing fleet of electric generators.

No significant impacts to human health and safety or the environment would be anticipated from the project. NO_x emissions would be significantly improved with an anticipated approximate 45 percent reduction; however there would be an increase in sulfur oxides (SO_x) and carbon monoxide (CO) emissions. No impacts to wetlands, floodplains, or threatened and endangered species would occur. Minor economic benefits would be derived indirectly during construction of the project and from decreased electric utility costs in the long-term.

1.0 BACKGROUND

In 1978, the Kansas Corporation Commission granted Sunflower Electric Power Corporation (Sunflower) the right to construct Holcomb Unit No. 1 (Holcomb Station) on a site in Finney County, Kansas. In 1980, the Rural Electrification Administration (REA) approved the financing for the project. Sunflower's Holcomb Station, located near Garden City, Kansas, was placed into commercial service on August 16, 1983. The total cost of plant construction was approximately $465 million.

The U.S. Department of Energy (DOE) and Sunflower have signed an agreement to use the utility's Holcomb Station power plant to field test an "integrated combustion optimization system" – an array of state-of-the-art sensors, controls, and clean-burning combustion modifications, all linked by sophisticated "neural network" software. The pollution reducing potential of the integrated system is expected to rival other devices now being installed on other coal-burning power plants, but overall costs are likely to be only half as much, a significant benefit for ratepayers.

The specific technology components to be added to the plant include a separated overfire air (SOFA) system, furnace sensors, coal flow measuring and control devices, and neural network controls. If successful, the "Integrated Combustion Optimization System" would reduce emissions to 0.15 to 0.22 pounds of NO_x per million Btus and simultaneously increase power output by 7 megawatts – all at less than half the cost of state-of-the-art NO_x control technology.

Individually, the components to be installed on Unit 1 of the Holcomb Station are all commercially available. What has not been accomplished is a demonstration of the enhanced pollution and cost reduction potential when they are linked together, particularly for western Powder River Basin coals. The Holcomb Station is already equipped with "first-generation" low-NO_x burners, which reduce NO_x pollutants by 40 to 45 percent at relatively low cost. With the application of SOFA, most of the incremental NO_X pollutant reductions come from combustion staging due to the overfire air. While applicable to all coal types, the low-sulfur and high reactivity of Powder River Basin coal would benefit the SOFA-based staging and inexpensive burner modifications that are at the core of the pollution reduction project goal.

Adding a system to measure and control coal flow and fineness, along with furnace sensors to define spatial distributions and neural network controls would further minimize the level of emissions at the plant and optimize combustion efficiency.

Currently, only selective catalytic reduction (SCR) technology is capable of consistently achieving the most stringent emission limits set by Federal and state standards – 0.15 pounds of NO_X per million Btus. Rather than reducing NO_X in the combustion zone, SCR uses chemical catalysts to scrub NO_x pollutants from a power plant's flue gas before release into the atmosphere. Consequently, SCR adds a complex and expensive chemical plant to a power

station.

The Integrated Combustion Optimization System, if successful, could provide a lower cost alternative to SCR controls, ultimately reducing the overall consumer cost of electricity. Further, it could also help reduce the duration of plant outages necessary for installing the system and improve overall electric system reliability.

Holcomb Station's installed criteria pollutant control equipment includes; a spray-dry absorber to achieve a sulfur dioxide (SO_2) emission rate of 0.18 lb/MM Btu (70 percent reduction); a fabric filter (baghouse) for a particulate matter emission rate of 0.03 lb/MM Btu (99.8 percent reduction); and, "first-generation" Babcock and Wilcox Lo-NO_x burners to achieve a nitrogen oxides (NO_x) emission rate of 0.28 lb/MM Btu (a 60 percent NO_x reduction). The unit is also subject to a limitation for carbon monoxide (CO) emissions.

The project would demonstrate the Low-NOx Burner/Separated Over-Fire Air (LNB/SOFA) technology as an alternative to Selective Catalytic Reduction (SCR) systems for units firing certain coal types. While SCR does generally achieve higher reductions in NO_x emissions (about 0.08 lb/MM Btu to 0.12 lb/MM Btu), it does so at higher capital and operating cost, requires the extensive use of critical construction labor, requires longer periods of unit outage for deployment, and generally requires longer periods of time to complete shakedown and full-scale operation. The proposed demonstration would generally be applicable to boilers using opposed-wall burners firing sub-bituminous coal from Wyoming's Powder River Basin.

A successful demonstration would provide utilities data and information to assess and confirm the applicability of LNB/SOFA integration to achieve their emission reduction requirements. Emission reductions to levels anticipated in the current New Source Performance Standard (NSPS) for utility boilers (about 0.15 to 0.22 lbs/mm Btu) are possible with this technology integration. Cost would be on the order of 15-25 percent of that for SCR, with consequential benefits. Substantial reductions in construction manpower requirements would result because outage time would be reduced from 8 to 12 weeks to about 4 weeks. Reductions in outage duration and cost would help to reduce periods of unavailability.

The $5.88 million project is part of the DOE's Power Plant Improvement Initiative (PPII), a DOE Office of Fossil Energy program that was implemented to provide Federal matching funds for projects that demonstrate innovative ways to reduce air emissions or boost the operating efficiencies of the nation's coal-fired power plants. DOE, through its National Energy Technology Laboratory, would provide $2.8 million for the 26-month project. Sunflower's contribution would be the additional $3.08 million required to implement the project.

Critical to the success of this project is Sunflower's partnership with DOE to provide zero-percent financing for the remaining portion of the project. Because some of these components have not been tried on Powder River Basin coal, and some components are un-tested, the risk associated with traditional financing for this entire project is beyond Sunflower's financial ability

to assume. Under the terms of the DOE's agreement with Sunflower, revenue from sales of the additional power output would be used to repay the Federal Government's share of the project.

The Sunflower agreement is the fourth of six projects signed under the PPII. Authorized by Congress as the precursor to President Bush's Clean Coal Power Initiative, the program is intended to demonstrate technologies that boost the efficiencies of currently-operating power plants – generating more megawatts from the same amount of fuel – or that allow currently-operating power plants to comply with environmental standards at lower costs. The Sunflower project would accomplish both objectives.

2.0 PURPOSE AND NEED FOR ACTION

The U.S. Department of Energy implemented the PPII to provide industry with an opportunity to demonstrate new technologies for improving operations of the nation's 450 existing coal-fired power plants. The PPII encouraged proposals to develop technologies that could either increase the amount of power currently being generated or that could help plants to avoid premature shutdowns by installing more effective or lower-cost pollution control technologies.

The latter approach (installing more effective or lower cost pollution controls) is of interest to power generators due to the potential for avoiding the high cost and lengthy time periods of unit outage required for installing alternative technologies. The project would demonstrate that a unit equipped with an existing low-NO_x burner system could be retrofitted with a new separated over-fire air (SOFA) system, coal flow measurement and control, and enhanced combustion monitoring to achieve about a 45 percent reduction in NO_x emissions.

The proposed modifications would also demonstrate a technology alternative to Selective Catalytic Reduction (SCR) systems for certain units firing certain coal types. While SCR does generally achieve higher reductions in NO_x emissions, it does so at higher capital and operating cost, requires the extensive use of construction labor, requires longer periods of unit outage for deployment, and generally requires longer periods of time to complete shakedown and full-scale operation.

The project would allow Sunflower and DOE to explore the possibility of installing several components that may significantly reduce emissions. Since these technologies could also increase the generating output of the unit, this project would meet two important objectives of the PPII.

3.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

3.1 Proposed Action

DOE proposes to provide partial funding to Sunflower to demonstrate the LNB/SOFA integration system to achieve NO_x emission reduction to the level of 0.15 to 0.22 lb/MM Btu. The proposed project station is Sunflower's 360 MW coal-fired generation station, Holcomb Unit No. 1 (Holcomb Station). The station, fueled by coal from Wyoming's Powder River Basin, is located near Garden City, in Finney County, Kansas. Total project cost is about $5.88 million, of which DOE would provide $2.8 million. The period of performance is expected to last approximately 2 years.

The Sunflower LNB/SOFA integrated system would be installed in three distinct phases to demonstrate the synergistic effect of layering NO_x control technologies. The three phases are:

Phase I	Advanced Monitoring/Coal Flow Measurement
Phase II	Low-NO_x Burner Modifications/Coal Flow Control
Phase III	Advanced Overfire Air/DCS Integration

Phase I - Advanced Monitoring would demonstrate the effectiveness of control upgrades with respect to NO_x control and thermal efficiency, with minimal impact from physical modification of the boiler. During this phase, instruments capable of measuring coal flow within individual coal conduits would be installed. Limited changes would be made to the plants' computing and control systems.

Phase II – Low-NO_x Burner Modifications would demonstrate the effectiveness of low-cost modifications to the existing, first generation low-NO_x burners for the reduction of NO_x emissions. The modifications would also include modifications to the existing pulverizer classifiers to permit automated fuel balancing among all burners and would include the installation of new burner tips and a better means of controlling air flow on individual burners.

Phase III - Advanced Over-Fire Air would demonstrate deeper NO_x control competitive to SCR installation with the addition of an overfire air system that would be coupled with the existing Phase I and II modifications to optimize system performance. Final combustion control integration with a new combustion control system (a contemporaneous improvement not included as a part of this project) would maximize potential NO_x reductions.

The materials used for the project would include both sheet and prefabricated steel products and thermal insulation systems for the principal modifications to the boiler and electrical and electronic subcomponents for the control systems. Once installed, small additional amounts of coal fuel, air, and water would be consumed in the production of electricity. This project would not require any new waste treatment, disposal, or recycling facilities. Small additional quantities

of flyash would be disposed in the on-site industrial landfills.

This project would commence in early 2003. The schedule would be determined by the need to coordinate the activities associated with the project to the scheduled outages of the generating unit. The final phase – installation of the separated over-fire air system – would require a four-week outage schedule.

3.2 No Action Alternative

Under the "No Action" alternative, DOE would not provide partial funding for the demonstration of the LNB/SOFA integration emission reduction technology. Under the No Action alternative, utilities would not have access to a demonstrated alternative to installing SCR technology on existing units. Since installing SCR technology does not provide the collateral opportunity to increase electric generation output, the opportunity to generate additional energy on existing units would not be realized.

4.0 AFFECTED ENVIRONMENT

4.1 Geology and Soils

Finney County, Kansas, is in the High Plains section of the Great Plains Physiographic province. The northeastern or panhandle part of the county is in the Plains Border section. Elevations range from about 2,450 feet in an area where the Pawnee River leaves the county, to 3,090 feet in the northeastern corner of the county.

The soil description for the property included as part of Sunflower's Holcomb Station includes Tivoli, Tivoli Dune, and Tivoli Vona soils. Tivoli-Vona Association is considered the soils of the sandhills. This association consists of a broad band of sandhills, mostly south of the valley of the Arkansas River. Three small, isolated areas of sandhills lie north of the valley. One is along the northern border of the county adjacent to the Scott and Lane counties; another lies a few miles north of Garden City, on the east side of the Scott-Finney depression; and the third is east of Garden City, along the north side of the Arkansas River.

4.2 Cultural Resources

A cultural resource survey was completed in preparation of the REA's Environmental Assessment for the construction of Holcomb Station in May 1979. According to the State Historic Preservation Officer, this survey met the need for review of the proposed plant's impact on the State's cultural resources and had no objection to its construction.

The nearest historical and archeological site to the proposed project is the Windsor Hotel, 421 N. Main, Garden City. This structure was included in the National Register of Historic Places for Kansas, October 14, 1987, and is the only site listed in Finney County.

4.3 Ecological Resources

The soils of Finney County were covered with native grasses before their cultivation. The native grass cover varies according to drainage and type of soil. Big bluestem, little bluestem, sideoats grama, indian grass, switch grass, western wheatgrass, blue grama, buffalo grass, hairy grama, plains mushy, sand dropseed, sedge, lead plant and western ragweed will generally constitute part of the mixture. Finney County has no native forests or large areas of woodland. Some urban and Arkansas River areas support mixed stands of cottonwood, salt-cedar, elms, and willows.

Wildflower life in Finney County is conspicuous for variety and profusion. Altitude, rainfall, climate, and soil determine the distribution. Easter daisy, Fremont's clematis, evening primrose, sunflowers, blazing star, purple cornflower, wild indigo, goldenrod, aster, prairie phlox and red ball constitute part of the species.

Wildlife in the project area includes raccoon, opossum, coyote, weasel and other small mammals. Deer are the only large mammals. Birds include pheasants, quail, prairie chicken, wild turkey and golden eagles.

Trees are rare in the vicinity of the project site except along hedgerows, creek beds, and the Arkansas River. Species used in hedgerows include Siberian elm, mulberry, eastern red cedar, Russian olive, cottonwood, ponderosa pine, and osage-orange. Cottonwood, salt-cedar, and willow also grow in the Arkansas River floodplain.

At Holcomb Station, vegetation is typically dominated by disturbance-tolerant weedy species, including lamb's-quarters, pigweed, and Russian thistle. Turf grasses, such as western wheatgrass and tall fescue are planted in lawn areas.

There are no wetlands on or adjacent to the plant site.

4.4 Threatened and Endangered Species

According to the Kansas Natural Heritage Inventory (KSNHI) office of the Kansas Biological Survey, the Arkansas River Shiner (*Notropis girardi*), bald eagle (*Haliaeetus leucocephalus*), piping plover (*Charadrius melodus*), least tern (*Sterna antillarum*), and whooping crane (*Grus americana*) are the federally-listed threatened species within Finney County. Two speices are currently candidates for federal listing in the county: lesser prairie-chicken (*Tympanuchus pallidicinctus*) and black-tailed prairie dog (*Cynomys ludovicianus*). In addition, the KSNHI reported several state-listed threatened or endangered species within the county. However, no records of rare, threatened, or endangered species exist within the proposed project site.

4.5 Water Resources

Groundwater movement within Finney County is generally to the southeast and flows generally from the west and north. Water is discharged by underflow on the east and south, by evapo-transpiration where the water table is shallow, by seepage to the Arkansas and Pawnee Rivers, and by pumping from wells. Except during short periods of local runoff, no flow has been observed in the Arkansas River channel near Holcomb station for the last five years.

4.6 Air Quality

Air quality within the proposed project area is good. Ambient levels for criteria pollutants are below National Ambient Air Quality Standards (NAAQS). Kansas, and therefore the project area, has achieved attainment for all criteria pollutants. Sunflower obtained a U.S. Environmental Protection Agency (EPA) Prevention of Significant Deterioration (PSD) Permit for the Holcomb Station. EPA granted the PSD permit before construction of permanent facilities began.

4.7 Noise

Holcomb Station is located in a very rural, remote part of Finney County and is surrounded by sand-sage prairie and farmland. Noise levels within the proposed project area are very low.

No sensitive noise receptors are located in the vicinity of the project site. Employees at the Holcomb Station wear hearing protection when they enter areas of the power station requiring safeguards against elevated noise levels.

4.8 Land Use

In general, land use in the vicinity of Holcomb Station is pasture and crop land. In the immediate area, native pasture is prevalent. Vegetation is dominated by grasses tolerant of sandy soils. To the north of the project site, along the Arkansas River, pasture, meadows, and dry land and irrigated crops are found. Wheat, corn, soybeans, and alfalfa are often cropped in the river valley. The same crops are farmed elsewhere outside of the river valley and north of the project site.

At Holcomb Station, land use is industrial. Vegetation in this type of area is typically dominated by disturbance-tolerant weedy species.

4.9 Socioeconomic Conditions

The 2000 Census reports the population of Finney County as 40,523 residents. The county has experienced tremendous growth in the last several years, largely due to growth in the commercial beef industry.

Table 1. Population Changes, Finney County, Kansas

Year	Population	Percent Change
2000	40,523	22.54
1990	33,070	38.80
1980	23,825	25.20
1970	19,029	

The median age of Finney County, Kansas residents is 28.1 according to the 2000 Census.

Per capita personal income has steadily grown in Finney County. The 1999 income for the County was $21,826 compared to $18,949 in 1995, according to the US Bureau of Economic Analysis, Regional Economic Information System. The per capita income figures traditionally lag statewide numbers, which is true for most of rural, western Kansas. Assessed valuation for

the county in 2000 was $357,500,000.

Table 2. Per Capita personal income, Finney County, Kansas

Year	Finney County	Kansas
1999	21,826	26,705
1990	15,620	18,182
1980	9,415	10,038

The job base for Finney County reflects the increase in manufacturing jobs over the past decades. Job growth for the service, construction, retail, and transportation sectors has also grown to support the manufacturing jobs.

Table 3. Employment by sector, Finney County, Kansas

Year	Retail	Service	Construction	Transportation	Manufacturing
1999	4,017	5,568	1,500	1,110	5,866
1990	3,372	4,502	911	1,031	4,816
1980	2,333	3,269	1,186	656	1,389

The total labor force for a sixty-mile radius surrounding Garden City is 34,649, including 18,189 workers in Finney County.

Local economic activity as reflected by taxable retail sales has steadily increased. During 2000 the county accounted for $498,200,000 in retail sales, up from $427,700,000 in 1995. The Retail Pull Factor, developed by the Kansas State University Cooperative Extension Service, identifies the ability of a county to attract retail sales from the counties within a given area. In 2000, Finney County had a pull factor of 1.16, indicating that it was the regional shopping hub in the area. Any number over 1.0 is considered favorable.

5.0 ENVIRONMENTAL IMPACTS

5.1 Geology and Soils

No direct impacts on regional geology and geological resources would be expected as a result of the proposed project due to the fact that no earthwork or piling would be required. In addition, no pre-existing geological conditions have the potential to adversely impact installation or operation of the facility.

5.2 Cultural Resources

No additional archeological investigations were deemed necessary when plans for constructing the Holcomb Station were being established. Because the proposed project would require no additional land disturbance, no additional investigations should be required. The Windsor Hotel, the county's only site listed on the National Register of Historic Places, is approximately 7 miles from the project location. Because of this distance and the very minor visual change from modification of the existing power plant, no impact on the viewshed of the Windsor Hotel would be anticipated.

5.3 Ecological Resources

No negative impacts to ecological resources would be anticipated as a result of the proposed project. The reduced NO_x emissions may have a positive impact on the surrounding ecology. In addition, because no wetlands are within the project area impacts to wetlands would not result from the proposed project.

5.4 Threatened and Endangered Species

The project site is located within the already constructed Holcomb Station. Therefore, no impacts to federally-listed threatened or endangered species would be anticipated as a result of the proposed project.

5.5 Water Resources

The existing water appropriation rights for the Holcomb 1 unit are 4,226 Acre-Feet annually (AF/yr). This quantity of water was approved by the Division of Water Resources (DWR) of the Kansas Department of Agriculture for 100 percent utilization of the initial facility. Water use for the previous 5-years has averaged 3,605 AF/yr (82 percent of that authorized), corresponding to an average capacity factor on the unit of (81 percent). While 78 Acre-Feet is the maximum potential impact, only about 47 AF/yr would be required to accommodate changes in planned operations due to proposed project. Because maintenance outages and general load demands limit

the unit to less than 100percent capacity factor, no additional water appropriations would be needed. Therefore, the impact from the proposed action would not be greater than that originally forecast for the Holcomb 1 generating unit, and no additional water rights would need to be acquired. Consequently, no additional approval by the DWR would be necessary.

The Holcomb Station plant is a zero-discharge facility, and therefore there are no direct impacts to streams or groundwater. Protection of groundwater is achieved by utilization of lined wastewater storage basins for the collection of various waste water streams, including coal-pile run-off. The resultant basin water is processed through a cold-lime softener system and reused in the plant processes. All discharged waters from the plant, except storm water, are released by evaporation from the cooling tower (the circulating water system) or by evaporation from the various storage basins.

The additional water use for the added energy generated by the proposed project would impact the wastewater treatment system to a very small degree. The wastewater streams at the plant have been enhanced since original construction and neither additional water treatment systems would be necessary nor would the basin storage systems be adversely impacted by the proposed project.

The proposed project site is not in the floodplain, and therefore no impacts to floodplains would occur.

5.6 Air Quality

All of the potential impacts to air quality would be evaluated and necessary permits, if any, would be issued according to procedures established by the Kansas Department of Health and Environment (KDHE). The existing regulations provide for the review of proposed changes if they are of sufficient magnitude to potentially impact the air quality of the region. Regulations, initially promulgated by the EPA, have been adopted by KDHE by reference and KDHE therefore has delegated authority under the Federal program.

The Clean Air Act imposes pre-construction permitting requirements, known as New Source Review (NSR), for modified sources. NSR includes a program of Prevention of Significant Deterioration (PSD) that is applied in areas that have attained the ambient air quality standards. Kansas has achieved attainment for all of the criteria pollutants. Congress intended these programs to apply generally where industrial changes might increase pollution in an area.

Sunflower has chosen to increase the capacity of the Holcomb 1 unit by increasing the boiler heat input (modification) beyond that of the original design. This modification would result in an increase in fuel consumption on an hour-by-hour basis and therefore makes necessary an evaluation of any increase in pollutant emissions. Since the area of impact of this modification has not been otherwise classified it would remain an attainment area for all criteria pollutants.

This classification establishes the particular structure of the evaluation under PSD.

The process of reviewing the impact of the modification made to an emissions source begins with the estimation of emissions increases for criteria pollutants. In the specific case of Holcomb 1, these changes require the evaluation of sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), volatile organics (VOC), and particulate matter (PM and PM_{10}). If, due to the modification, these increases would be greater than established thresholds, the new source must install cost-effective Best Available Control Technology (BACT) for each pollutant that would exceed its threshold. The anticipated changes in emissions for this project are shown in Table 4.

Table 4. Air Emissions Estimates from the Proposed Activity

Pollutant Type	Expected Actual Emissions Increase (Tons per Year)	PSD Significance Threshold (Tons per Year)
Nitrogen Oxides (NOx)	-1,121	40
Carbon Monoxide (CO)	1,780	100
Sulfur Dioxide (SO_2)	64	64
Volatile Organic Compounds (VOC)	2	10
Particulate Matter (PM/PM_{10})	1/4	15/25

The NO_x pollutant in the flue gas is created in the primary furnace when combustion takes place at high temperatures and because of the close proximity between oxygen and the fuel-bound and air-bound nitrogen molecules in the fuel and the combustion air supply. An estimate of the future expected annual emissions indicates a large net decrease in NO_X emissions (1,100 tons) which would result from the use of the dual element, deep-staging combustion technology associated with this project. A portion of this decrease would be observable when the Phase II modifications are made (a first element low-NO_x burner improvement program). The final reductions would occur with the Phase III improvements (installation of separated over-fire air) that are scheduled for completion in 2004. Because NO_x emissions would not increase by an amount greater than 40 tons annually, a BACT evaluation would not be required for NO_x emissions associated with the project.

The future expected annual emissions of SO_2 would increase in relationship to past actual emissions in excess of the annual threshold of 40 tons. Such as increase requires that the increase in emissions be evaluated to determine if the National Ambient Air Quality Standards would be violated (a process accomplished by modeling analyses) and that a BACT analysis be conducted for the types of control technology that can be installed for SO_2. In general, such a requirement would result in an evaluation of various scrubber options to determine which option would provide the BACT. Inasmuch as Holcomb 1 already has a well-functioning installed scrubber and that it uses low sulfur coal, the existing technology would be evaluated

incrementally for cost effective improvements. Past actual performance of the control device installed on the unit suggests that it has been successful in removing 75 percent of the SO_2 created in the boiler combustion process. Thus, BACT is already installed on the plant and a revised permit condition that requires an 80 percent removal (up from the current 70 percent requirement) can be achieved by the existing control equipment without causing long-term operating problems. The resulting emissions increase is shown in Table 4.

The SO_2 emission rate would be dependent upon the sulfur content of the fuel consumed. In the NSR analysis it was assumed that the identical fuel used for the previous 5 years would continue to be used. Under the conditions of this assumption a potential increase in emissions of 65 tons annually was projected.

The annual emission of carbon monoxide (CO) would increase by 1,780 tons as indicated in Table 4. This increase would occur concurrently with the installation of the deep-staged separated over-fire air system and is an artifact of the technology. The estimated emission rate would be consistent with that of recent new source construction permits, including the permit for a companion unit at Holcomb. (This emission rate was modeled for the full 600 MW for Holcomb 2 and no adverse ambient air impact was indicated). EPA has generally accepted these higher CO emission levels when they occur as an offset to a decrease in NO_x emissions.

Emissions of volatile organic compounds (VOC), particulate matter (PM), and particulate matter less than 10 microns in diameter (PM_{10}) are estimated to be below the threshold that would require a separate BACT analysis for each pollutant. In addition to these stack emissions, the fugitive emission regulation must be applied to the total estimate for PM/PM_{10}. Although fugitive estimates have not yet been made, estimates made for the companion unit indicate that fuel and ash handling activities would not cause either threshold criteria (15/25 tons annually) to be exceeded.

Through coordination with EPA and KDHE, neither Phase 1 nor Phase 2 would require PSD review, but Phase 3 would require PSD analysis. To satisfy the PSD review requirements, the process would be concluded and a permit issued before on-site construction efforts towards the installation of separated over-fire air would be initiated.

5.7 Noise

No changes in the ambient noise levels would result from the proposed project.

5.8 Land Use

Decisions relating to land use impacts are the responsibility of either the Finney County

Commission for zoning or the Kansas Department of Health and Environment for permit issuance, if required. Because the proposed action would utilize an existing site, no additional impacts to the land would occur.

Dry combustion byproducts would be placed in the on-site landfill. The landfill would have sufficient capacity for up to 60 years of the intended combustion byproducts. The annual amount of ash to be managed at 100 percent utilization would be 3,541 tons; however, only about 2,125 tons annually would be anticipated. Currently, about 70,000 tons are now deposited annually. Therefore, the additional amount would result in only a minor increase in material landfilled. Further, no additional land use requirements to accommodate the additional ash disposal and no additional zoning action would be required.

Waste materials resulting from installation of the proposed project would be minimal and would consist of standard construction debris. The debris would not be hazardous and would therefore be disposed of in permitted landfills or recycled, as appropriate.

5.9 Socioeconomic Effects

No long-term socioeconomic impacts would be expected from this project. The project would not create additional permanent jobs for the region. Much of the engineering and software design for the project would occur at vendor sites rather than at Holcomb Station. On-site work for the project would be done by Sunflower employees or contractors hired for specific tasks of the project. However, some minor, temporary local benefits for local hospitality businesses would occur during project construction from workers patronizing local motels and restaurants.

Because the proposed project would be at the existing site of Holcomb Station in rural Finney County, no disproportionately high or adverse effects on minority or low-income populations would be expected.

5.10 Irretrievable Commitment of Resources

The materials used for the project would include both sheet and prefabricated steel products and thermal insulation systems for the principal modifications to the boiler, and electrical and electronic subcomponents for the control systems to be deployed. Once installed, small additional amounts of coal fuel, air, and water would be consumed in the production of additional electricity. The maximum additional coal necessary for this energy would be 64,385 tons annually; however only about 60 percent of this amount (about 38,640 tons) is expected to be required.

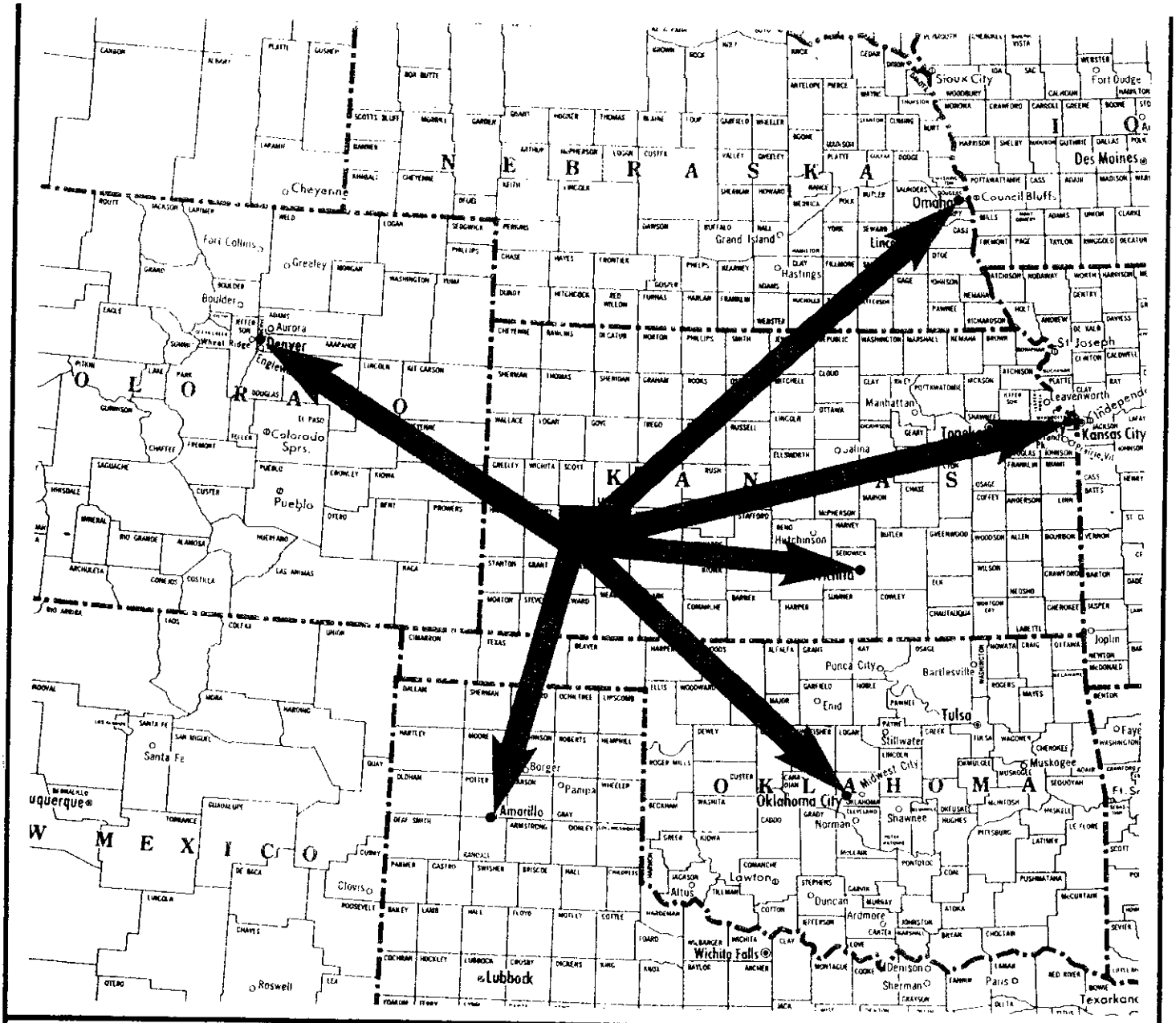
6.0 CONCLUSIONS

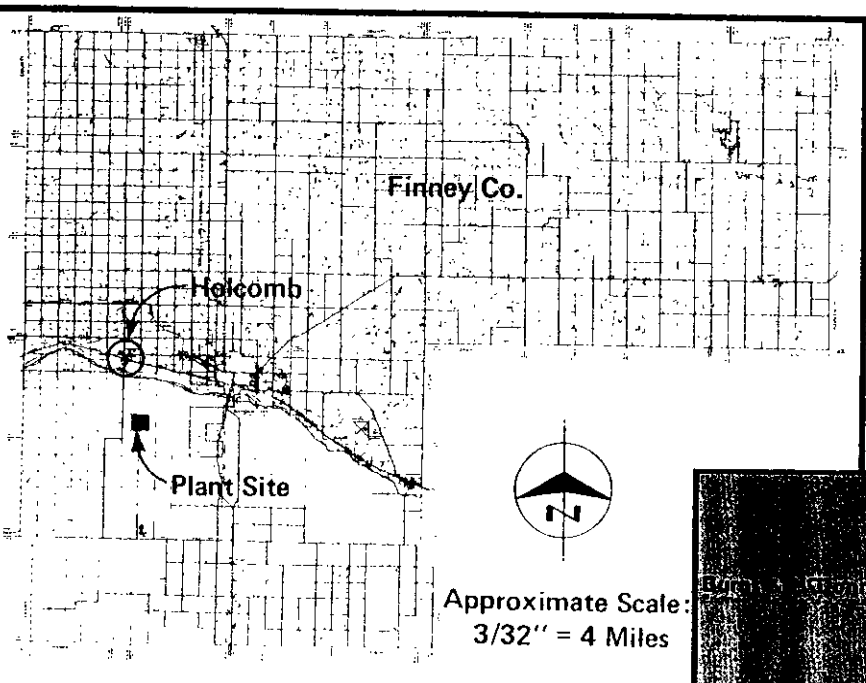
The proposed project would be constructed on a previously disturbed site within the Holcomb Station and no impacts to geology, soils or cultural resources would occur. No impacts would be expected to ecological resources, water resources, or floodplains. Construction and operation of the proposed project would not be expected to impact any Federal- or state-listed threatened or endangered species.

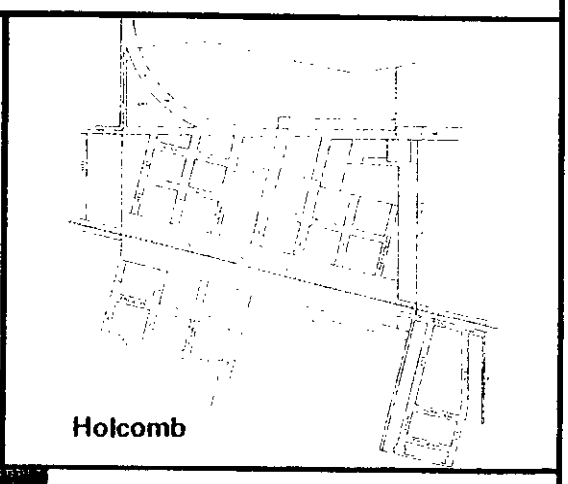
Air quality from the project would have both positive and negative impacts. NO_x emissions would be significantly improved with an anticipated 45 percent reduction. However, SO_x and CO emissions would increase. EPA has generally accepted increases in CO emission levels when they occur as a result of substantial decreases in NO_X emissions. Because the Holcomb 1 unit has a well-functioning installed SO_x scrubber and uses low-sulfur coal, about 80 percent removal of SO_x can be achieved by the existing control equipment. The project would not affect the air quality attainment status of the area.

No changes in noise levels or land use would be expected as a result of the proposed project. Minor economic benefits would be derived indirectly during construction of the project and from decreased electric utility costs in the long-term.

The proposed Low-NO_X Burner/Separated Over-Fire Air integration system project would be expected to demonstrate a technology that would boost power-generating efficiencies and allow the currently-operating Holcomb Station to comply with environmental standards at lower costs. Therefore, the Sunflower project would accomplish both objectives of the Power Plant Improvement Initiative.







Approximate Scale:
3/32" = 4 Miles

Figure A-3
PROJECT LOCATION

SUN 74 LANT ENVIRON. ANAL.

APPENDIX B

DISTRIBUTION LIST

Distribution List

Kansas Department of Health and Environment
Division of Environment-Bureau of Water
1000 SW Jackson Street, Suite 400
Topeka, KS 66612-1367
ATTN: Donna Fisher

Larry Zuckerman
Aquatic Ecologist
Environmental Services Section
Kansas Department of Wildlife & Parks
512 SE 25th Avenue
Pratt, KS 67124-8174

Richard Pankratz
Historic Preservation Department
Kansas State Historical Society
6425 SW 6th Avenue
Topeka, KS 66615-1099

William H. Gill, Field Supervisor
US Fish & Wildlife Service
Kansas Field Office
315 Houston Street, Suite E
Manhattan, KS 66502-6172

David R. Hibbs
Regulatory Branch – Operations Division
Kansas City District, US Army Corps of Engineers
700 Federal Building
Kansas City, MO 64106-2896

Mark Rude
Kansas Division of Water Resources
2508 Johns Street
Garden City, KS 67846-2804

Mr. James Gulliford
Regional Administrator
US EPA, Region 7
901 N. 5th Street
Kansas City, KS 66101

Kansas Department of Health and Environment
Bureau of Air Quality and Radiation
1000 SW Jackson Street, Suite 310
Topeka, KS 66612-1367
ATTN: Ralph Walden

Reading Rooms

Mr. Tom Hehman, Interim Director
Finney County Public Library
605 East Walnut
Garden City, KS 67846

Mr. Corey Linville
Sunflower Electric Power Corporation
Holcomb Station
2440 Holcomb Lane
Holcomb, KS 67851

Mr. Wayne Penrod
Sunflower Electric Power Corporation
2075 West Saint John Street
Garden City, 67846

Ms. Claire Gustin
Sunflower Electric Power Corporation
P.O. Box 1020
301 West 13th Street
Hays, KS 67601