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FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE GILBERTON COAL-TO-CLEAN FUELS AND POWER PROJECT

GILBERTON, PENNSYLVANIA

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Final Environmental Impact Statement for the Gilberton Coal-to-Clean Fuels and Power Project

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ABSTRACT

This EIS assesses the potential environmental impacts that would result from a proposed DOE action to provide cost-shared funding for construction and operation of facilities near Gilberton, Pennsylvania, which have been proposed by WMPI PTY, LLC, for producing electricity, steam, and liquid fuels from anthracite coal waste (culm). The project has been selected by DOE under the Clean Coal Power Initiative (CCPI) to demonstrate the integration of coal waste gasification and Fischer-Tropsch (F-T) synthesis of liquid hydrocarbon fuels at commercial scale. The proposed facilities would use a gasifier to convert coal waste to synthesis gas, which would be conveyed to F-T liquefaction facilities for production of liquid fuels and to a combined-cycle power plant. The power plant would use the synthesis gas to drive a gas combustion turbine and exhaust gas from the gas turbine to generate steam from water to drive a steam turbine. Both turbines would generate electricity.

The EIS evaluates potential impacts of the proposed facilities on land use, aesthetics, air quality, geology, water resources, floodplains, wetlands, ecological resources, socioeconomic resources, waste management, human health, and noise. The EIS also evaluates potential impacts on these resource areas for a scenario resulting from the no-action alternative (DOE would not provide cost-shared funding) in which the proposed facilities would not be built or operated.

PUBLIC PARTICIPATION

DOE encourages public participation in the NEPA process. Comments were invited on the Draft EIS after publication of the Notice of Availability in the Federal Register on December 8, 2005. The public comment period ended on February 8, 2006. DOE considered late comments to the extent practicable. DOE conducted two formal public hearings to receive comments on the Draft EIS: on January 9, 2006, in Shenandoah, Pennsylvania, and on January 10, 2006, in Pottsville, Pennsylvania. An informational session was held prior to each of these hearings for the public to learn more about the proposed project. The public was encouraged to provide oral comments at the hearings and to submit written comments to DOE by the close of the comment period.

On January 12, 2007, a Notice of Availability was published in the Federal Register to invite comments on the Supplement to the Draft EIS (DOE/EIS-0357D-S1) that was issued to correct estimates of CO_2 emissions from the proposed plant that were published in the Draft EIS, and to provide additional information regarding CO_2 releases and CO_2-related cumulative impacts. The comment period for the Supplement to the Draft EIS ended on February 27, 2007. In preparing this Final EIS, DOE considered both oral and written comments on the Draft EIS and comments on the Supplement to the Draft EIS.

CHANGES FROM THE DRAFT EIS

All changes, which have been made to improve the usefulness of the document to the decision maker and to be responsive to the public, are shown in boldface italic font (as is this paragraph). Exceptions to the bold face italic style are: Appendix E, which contains the Supplement to the Draft EIS; Appendices D and F, which contain the comments and responses to the draft EIS and the Supplement to the Draft EIS, respectively; and Appendix G, which is a Comparison of the Potential Impacts of Petroleum Coke and Anthracite Culm Use. Appendices D through G are presented in Volume 2 of this EIS.

TABLE OF CONTENTS

VOLUME 1: MAIN TEXT

VOLUME 2: APPENDICES

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

ADT	average daily traffic
amsl	above mean sea level
BMP	best management practices
Btu	British thermal unit
°C	degrees Celsius
CCPI	Clean Coal Power Initiative
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	centimeter
CO	carbon monoxide
CO_2	carbon dioxide
dB	decibel
dB(A)	decibels as measured on the A-weighted scale
DOE	U.S. Department of Energy
EIS	environmental impact statement
EMF	electromagnetic fields
EPA	U.S. Environmental Protection Agency
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FR	Federal Register
F-T	Fischer-Tropsch
ft	feet
ft^3	cubic feet
g	acceleration of gravity
gal	gallon
gpm	gallons per minute
H_2	hydrogen gas
H_2O	water
H_2S	hydrogen sulfide
HRSG	heat recovery steam generator
in	inch
IPCC	Intergovernmental Panel on Climate Change
ISCST	Industrial Source Complex Short-Term (an air dispersion model)
kg	kilogram
L	liter
lb	pound
m^3	cubic meter
µg	microgram
µm	micrometer
µS	microsiemens
MCLG	Maximum Contaminant Level Goal
mg	milligram
mgd	million gallons per day
mV	millivolt
MW	megawatt

NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NIEHS	National Institute of Environmental Health Sciences
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	National Research Council
NSC	National Safety Council
O_3	ozone
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
Pb	lead
PDC	Pennsylvania Department of Corrections
PDCNR	Pennsylvania Department of Conservation and Natural Resources
PADEP	Pennsylvania Department of Environmental Protection
PDLI	Pennsylvania Department of Labor and Industry
PEMA	Pennsylvania Emergency Management Agency
PennDOT	Pennsylvania Department of Transportation
PFBC	Pennsylvania Fish and Boat Commission
PGC	Pennsylvania Game Commission
pH	hydrogen-ion concentration notation
PM	particulate matter
PM-2.5	particulate matter less than 2.5 µm in aerodynamic diameter
PM-10	particulate matter less than 10 µm in aerodynamic diameter
PNDI	Pennsylvania Natural Diversity Inventory
ppm	parts per million
PSD	Prevention of Significant Deterioration
R&D	research and development
RCRA	Resource Conservation and Recovery Act
s	second
SAIC	Science Applications International Corporation
SCEMA	Schuylkill County Emergency Management Agency
SCREEN3	a screening air dispersion model
SCOT	Shell Claus Off-gas Treating
SEDCO	Schuylkill Economic Development Corporation
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SPLP	Synthetic Precipitation Leaching Procedure
SRBC	Susquehanna River Basin Commission
U.S.	United States
USC	United States Code
USGS	U.S. Geological Survey
VOC	volatile organic compound
yd^3	cubic yard

GLOSSARY

Aerodynamic diameter—a term used to describe particles with common aerodynamic properties, which avoids the complications associated with varying particle sizes, shapes, and densities. For example, PM-10 is defined in 40 CFR 50 as consisting of particles 10 micrometers or less in aerodynamic diameter, meaning particles that behave aerodynamically like spherical particles of unit density (1 gram per cubic centimeter) having diameters of 10 micrometers or less.

Air dispersion model—computer program that incorporates a series of mathematical equations used to predict downwind concentrations in the ambient air resulting from emissions of a pollutant. Inputs to a dispersion model include the emission rate; characteristics of the emission release such as stack height, exhaust temperature, and flow rate; and atmospheric dispersion parameters, such as wind speed and direction, air temperature, atmospheric stability, and height of the mixed layer.

Anthracite—the hardest type of coal, characteristically black in color, lustrous, with a conchoidal fracture (smoothly curved, irregular breakage surface). Anthracite coal consists of 92-98% carbon and less than 8% volatile constituents by weight.

Anticline—a geologic fold that is arch-like in form, with rock layers dipping outward from both sides of the axis, and older rocks in the core. The opposite of syncline.

Aquifer—a body of rock or sediment that is capable of transmitting groundwater and yielding usable quantities of water to wells or springs.

Artesian—groundwater conditions in which water in wells rises above its level in the aquifer, including conditions in which groundwater rises to the ground surface or above.

Ash—the mineral content of a product remaining after complete combustion.

Baghouse—an air pollution control device that filters particulate emissions, consisting of a bank of bags that function like the bag of a vacuum cleaner; the bags intercept particles that are mostly larger than 10 micrometers in aerodynamic diameter.

Beneficiation—the process of washing or otherwise cleaning coal to increase the energy content by reducing the ash content.

Biochemical oxygen demand - a standard quantitative measure of water pollution. It is the amount of oxygen consumed in the biological oxidation (by bacteria or other microorganisms) of organic material in a unit volume of waste water, as measured over a five-day period.

Biocide—a substance (e.g., chlorine) that is toxic or lethal to many organisms and is used to treat water.

Blowdown—the portion of steam or water removed from a boiler at regular intervals to prevent excessive accumulation of dissolved and suspended materials.

Bottom ash—combustion residue composed of large particles that settle to the bottom of a combustor from where they can be physically removed.

Building downwash—the downward movement of an elevated plume toward the area of low pressure created on the downwind (lee) side of a structure in the wake around which the air flows.

Capacity factor—the percentage of energy output during a period of time compared to the energy that would have been produced if the equipment operated at its maximum power throughout the period.

Census tract—a small, relatively permanent statistical subdivision of a county.

Chemical oxygen demand - a standard quantitative measure of water pollution. It is the amount of oxygen required to decompose all of the organic matter and other chemical constituents in a unit volume of wastewater that are susceptible to oxidation by a strong chemical oxidizing agent.

Coal gasification—a process that converts coal into a gaseous product, which involves crushing coal into a powder and heating the powder in the presence of steam and oxygen. After impurities (e.g., sulfur) are removed, the gas can be used as a fuel or further processed and concentrated into a chemical or liquid fuel.

Combustor—equipment in which coal or other fuel is burned at high temperatures.

Cooling water—water that is heated as a result of being used to cool steam and condense it to water.

Culm—coal waste that consists of rock and coal with varying amounts of carbon material remaining after removal of higher-quality saleable coal.

Culm bank—a pile or other deposit of culm on the land surface.

Evapotranspiration—the amount of water removed from a land area by the combination of direct evaporation and plant transpiration.

Fault—a fracture or fracture zone in rock along which the sides have been displaced vertically or horizontally relative to one another.

Fischer-Tropsch (F-T) synthesis—a process that uses a metal-containing catalyst to convert a mixture of carbon monoxide and hydrogen (known as synthesis gas) into a mixture of carbon dioxide, water, and aliphatic compounds (hydrocarbons lacking an arrangement of atoms in their molecular structure), which are used to produce liquid fuels.

Floodplain—the strip of relatively level land adjacent to a river channel that becomes covered with water if the river overflows its banks.

Flue gas—residual gases after combustion that are vented to the atmosphere through a flue or chimney.

Flux—a material (e.g., limestone) that is added to a substance to lower the melting temperature of the substance and promote fluidity.

Fly ash—combustion residue composed of fine particles (e.g., soot) that are entrained with the draft leaving the combustor.

Formation—the primary unit associated with formal geological mapping of an area. Formations possess distinctive geological features and can be combined into "groups" or subdivided into "members."

Gaussian—concentrations of pollutants downwind of a source are assumed to form a normal distribution (i.e., bell-shaped curve) from the centerline of the plume in the vertical and lateral directions.

Groundwater—water below the ground surface in a zone of saturation.

Hazardous waste—a category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20 through 40 CFR 261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the Environmental Protection Agency in 40 CFR 261.31 through 40 CFR 261.33.

Integrated gasification combined-cycle—a process that uses synthesis gas derived from coal to drive a gas combustion turbine and exhaust gas from the gas turbine to generate steam from water to drive a steam turbine.

Laydown area—material and equipment storage area during the construction phase of a project.

Leachate—solution or product obtained by leaching, in which a substance is dissolved by the action of a percolating liquid.

Liquefaction—the process of transforming a gas into a liquid.

Magnitude (of an earthquake) —a quantity that is characteristic of the total energy released by an earthquake. Magnitude is determined by taking the common logarithm of the largest ground motion recorded on a seismograph during the arrival of a seismic wave type and applying a standard correction factor for distance to the epicenter. A one-unit increase in magnitude (e.g., from magnitude 6 to magnitude 7) represents a 30-fold increase in the amount of energy released.

Maximum Contaminant Level Goal (MCLG) —the maximum concentration of a substance in drinking water at which there is no known or anticipated adverse effect on human health, and which allows an adequate margin of safety, as determined by the U.S. Environmental Protection Agency.

Petroleum coke—a high-sulfur, high-energy product having the appearance of coal, which is produced by oil refineries by heating and removing volatile organic compounds (VOCs) from the residue remaining after the refining process.

pH—a measure of the relative acidity or alkalinity of a solution, expressed on a scale from 0 to 14, with the neutral point at 7. Acid solutions have pH values lower than 7, and basic (i.e., alkaline) solutions have pH values higher than 7.

Plume (atmospheric)—a visible or measurable, elongated pattern of emissions spreading downwind from a source through the atmosphere.

Rectisol – A process to remove acid gases, such as hydrogen sulfide, from gasification syngas.

Reference concentrations –- estimates of continuous inhalation exposure to human population (including sensitive subgroups) that are likely to be without an appreciable risk of deleterious effects during a lifetime.

Safe yield—the maximum quantity of water that can be withdrawn continuously from a surface water or groundwater source during a 50-year (or greater) drought without ultimate depletion of the source (considering intrusion of undesirable-quality water, interference with other existing water sources, downstream flow requirements, and other factors).

Secondary drinking water standards—non-enforceable federal guidelines regarding cosmetic effects (e.g., tooth or skin discoloration) or aesthetic effects (e.g., taste, odor, or color) of drinking water.

Selective catalytic reduction—a system to reduce NO_x emissions by injecting a reagent such as ammonia into exhaust gas to convert NO_x emissions to nitrogen gas and water via a chemical reduction reaction.

Slag—*solid glassy inorganic byproduct of a gasification, smelting, or steel manufacturing process, generally consisting primarily of silicates, aluminosilicates, and oxides; formed from the solidification of molten material skimmed from the top of a molten metal bath or collected at the bottom of a combustor or boiler.*

Sludge—a semi-solid residue containing a mixture of solid waste material and water from air or water treatment processes.

Slurry—a watery mixture or suspension of fine solids, not thick enough to consolidate as a sludge.

Specific yield—the volume of water released from storage in a unit area of an unconfined aquifer per unit decline in the water table. Values are dimensionless (corresponding, for example, to cubic feet of water per square foot of aquifer per foot of water table decline) and typically are between 0.01 and 0.3. In physical terms, the specific yield can be understood as the fraction of the aquifer volume that consists of drainable void space.

Spring—a location on the land surface or the bed of a surface water body where groundwater emerges from rock or soil without artificial assistance.

Syncline—a geologic fold in which the rock layers dip inward from both sides toward the axis, with younger rocks in the core. The opposite of anticline.

Synthesis gas—a mixture of gases produced as feedstock, especially as a fuel produced by controlled combustion of coal in the presence of water vapor.

Tailings pond—an outside water-filled enclosure that receives discharges of wastewater containing solid residues from processing of minerals. The solid residues settle due to gravity and separate from the water.

Wetlands—areas that are inundated by surface water or groundwater with a frequency sufficient to support, under normal circumstances, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflow areas, mudflats, and natural ponds.

SUMMARY

This environmental impact statement (EIS) has been prepared by the U.S. Department of Energy (DOE), in compliance with the National Environmental Policy Act of 1969 (NEPA) as amended (42 USC 4321 et seq.), Council on Environmental Quality regulations for implementing NEPA (40 CFR Parts 1500-1508), and DOE NEPA regulations (10 CFR Part 1021). The EIS evaluates the potential environmental impacts associated with the construction and operation of facilities near Gilberton, Pennsylvania, which have been proposed by WMPI PTY, LLC, for producing electricity, steam, and liquid fuels from anthracite coal waste (culm). The project has been selected by DOE under the Clean Coal Power Initiative (CCPI) to demonstrate the integration of coal waste gasification and Fischer-Tropsch (F-T) synthesis of liquid hydrocarbon fuels at commercial scale. The CCPI Program accelerates commercial deployment of advanced coal-based technologies for generating clean, reliable, and affordable electricity in the United States by moving promising technologies from research and development (R&D) to the commercial marketplace through demonstration.

The EIS will be used by DOE in making a decision on whether or not to provide approximately $100 million (about ***10***% of the total cost of approximately $***1 billion***) in cost-shared funding to design, construct, and demonstrate the technologies proposed by WMPI PTY, LLC, at the proposed facilities. The proposed action (DOE's preferred alternative) is for DOE to provide the cost-shared funding. DOE determined that providing cost-shared funding for the proposed project would constitute a major federal action that may significantly affect the quality of the human environment. Therefore, DOE has prepared this EIS to assess the potential impacts on the human and natural environment of the proposed action and reasonable alternatives.

The proposed facilities would use a gasifier to convert coal waste to synthesis gas, which would be conveyed to F-T liquefaction facilities for production of liquid fuels and to a combined-cycle power plant. The power plant would use the synthesis gas to drive a gas combustion turbine and exhaust gas from the gas turbine to generate steam from water to drive a steam turbine. Both turbines would generate electricity. For coal gasification, the project would use Shell technology, which has operated commercially using coal feedstock in the Netherlands since the 1990s. For liquefaction, the SASOL F-T technology would be used, which has operated commercially in South Africa since the 1980s.

The proposed ***Gilberton Coal-to-Clean Fuels and Power project would demonstrate the first clean coal power facility in the United States using coal waste gasification as the basis for power, thermal energy, and liquid fuels production. A successful demonstration would*** generate technical, environmental, and financial data from the design, construction, and operation of the ***facilities to confirm that the integrated technologies can be implemented at the commercial scale***. While the individual technologies have been independently operated, this project would demonstrate the integration of the technologies, which may ultimately help to reduce U.S. dependence on imported oil.

The site for the proposed project is located adjacent to the existing Gilberton Power Plant in the western portion of Mahanoy Township in Schuylkill County in eastern Pennsylvania. The area is primarily rural with a mixture of industrial, commercial, and residential land use in the vicinity. The site is about 1 mile north of Interstate 81. The city of Pottsville is located about 8 miles to the south of the site. The main plant for the proposed project would occupy about 75 acres of nearly level WMPI-owned land on top of Broad Mountain. The land is currently an undisturbed forested area.

Construction of the proposed facilities would ***occur over a 2.5-year period***. An average of 516 construction workers would be at the site during the construction period; approximately 1,000 workers would be required during the peak construction period. Demonstration (including performance testing and monitoring) would be conducted over a 3-year period ***following completion of construction***. If the demonstration is successful, commercial operation would follow immediately. About 250 workers would be required during the demonstration, and 150 workers would be needed for long-term operations. The facilities would be designed for a lifetime of ***50*** years.

The primary feedstock for the proposed facilities would be low-cost anthracite culm, which is a locally abundant, previously discarded resource. ***Culm reserves controlled by the applicant could supply the proposed facilities for about 15 years, and are more than sufficient for the three-year demonstration period. WMPI controls 65 million tons of surveyed culm reserves (estimated to be equivalent to about 16 million tons of beneficiated culm), plus an estimated 85 million tons (equivalent to about 21 million tons of beneficiated culm) that have not been surveyed. A conservative estimate of the amount of locally available culm is 100 million tons (equivalent to about 25 million tons of beneficiated culm).***

The culm would be trucked to the site from the surrounding local area. The proposed facilities would also be capable of using a blend of feedstock containing up to 25% petroleum coke. Micronized limestone, which would be used as a flux added to the feedstock to lower the ash melting temperature of the culm and promote fluidity, would be trucked from mines within 100 miles of the project site.

The facilities would produce about 5,000 barrels of liquid fuels per day and 41 MW of electricity for export to the regional power grid. To reduce costs, the project would take advantage of existing local infrastructure, including rail, water, and transmission lines. The net efficiency would be about 45%, compared to an efficiency of about 33% for a traditional coal-fired power plant and about 40% for a state-of-the-art integrated gasification combined-cycle power plant.

Proposed emissions from the facilities would be small, especially for sulfur dioxide (SO_2), because most of the sulfur would be removed from the synthesis gas prior to conveying the gas to the F-T liquefaction facilities and the combined-cycle power plant. The use of anthracite culm would reduce waste disposal from operating mines and ***support*** reclamation of land currently stockpiled with culm.

Alternatives to the Proposed Action

The EIS ***examines*** the proposed action (funding the demonstration ***project***) and the no-action alternative (not funding the demonstration project). Other alternatives to the proposed action have been ***considered*** and found not to be reasonable alternatives. ***Under the CCPI Program, DOE's role is limited to approving or disapproving the project as proposed by the industrial participant, including the proposed technology and site.***

EIS Process

Scoping

DOE initiated this NEPA review process by publishing in the Federal Register (April 10, 2003; 68 FR 17608–11) a Notice of Intent to prepare the EIS and hold a public scoping meeting. The Notice of Intent invited comments and suggestions on the proposed scope of the EIS, including environmental issues and alternatives, and invited participation in the NEPA process. Advertisements publicizing the public scoping meeting were printed in the Pottsville, Pennsylvania, newspaper, a flyer announcing the public scoping meeting was posted at the public library in Frackville, Pennsylvania, and notices were mailed to stakeholders including federal, state, and local agencies. DOE held a scoping meeting in Pottsville on May 5, 2003, and accepted scoping comments until May 19, 2003.

DOE considered these comments in developing the Draft EIS, in which issues were analyzed and discussed in accordance with their level of importance. The most detailed analyses focused on issues associated with air quality, surface water, groundwater, and solid waste impacts.

Draft Environmental Impact Statement

On December 8, 2005, DOE issued a Notice of Availability in the Federal Register (70 FR 73003-05) to announce the availability of the Draft EIS for public review and comment. The Notice of Availability announced two public hearings on the Draft EIS and invited agencies, organizations, and individuals to present oral comments and submit written comments on the adequacy, accuracy, and completeness of the EIS. On December 24 and 31, 2005, advertisements publicizing the public hearing were printed in Pottsville and Hazleton, Pennsylvania, newspapers; information to announce the public hearings was provided to local publications, radio stations, and television stations in the Schuylkill County region; and flyers announcing the hearings were distributed in the community. The Draft EIS was sent to stakeholders including federal, state, and local agencies, environmental groups, and public citizens for their review and comment. Copies of the Draft EIS were made available at the Pottsville Public Library, Frackville Public Library, Mahanoy City Public Library, and the library at the Mahanoy State Correctional Institution.

Publication of the Notice of Availability initiated the public comment period on the Draft EIS. DOE conducted two formal public hearings to receive comments on the Draft EIS: on January 9, 2006, in Shenandoah, Pennsylvania, and on January 10, 2006, in Pottsville, Pennsylvania. An informational session was held prior to each of these hearings for the public to learn more about

the proposed project. The public was encouraged to provide oral comments at the hearings and to submit written comments to DOE by the close of the comment period on February 8, 2006. Testimony was presented by 28 persons during the public hearings, and DOE received correspondence from 95 members of the public, interested groups, and federal, state, and local officials, as well as over 400 inmates at the Mahanoy State Correctional Institution. The comments helped to improve the quality and usefulness of the EIS.

Generally, DOE responded to these comments by revising the appropriate sections of the EIS to provide the requested information or further explore areas of potential impact. In addition, WMPI has agreed to certain measures to reduce and mitigate potential impacts. All comments on the Draft EIS and corresponding responses by DOE are contained in Appendix D of this Final EIS. Where responses to comments have initiated changes that appear in the Final EIS, they have been so noted in the comment response.

Supplement to the Draft EIS

DOE received comments on the Draft EIS from the Natural Resources Defense Council (NRDC) and from several other organizations and members of the public regarding how the Draft EIS addressed CO_2 emissions from the proposed project. In order to address these comments, DOE staff met with NRDC representatives on June 27, 2006, to ensure that the Department understood the comments, which expressed concerns about the potential impacts of CO_2 emissions on global warming and questioned the accuracy of the annual rate of CO_2 emission reported in the Draft EIS. NRDC requested that DOE enhance the analysis of potential CO_2-related cumulative impacts, further explore the feasibility of CO_2 sequestration, and provide a public comment opportunity on the revised sections of the EIS.

In considering these comments, DOE found that the annual rate of CO_2 emissions reported in the Draft EIS included only the total quantity of CO_2 that would be emitted directly from the proposed facilities. The reported quantity did not include a larger quantity of CO_2 in a concentrated stream exiting the Rectisol unit that would also be emitted. It was previously anticipated that this stream would be sold; however, the industrial participant has informed DOE that the commercial sale of the CO_2 would not occur in the foreseeable future, and therefore, all of the CO_2 would be emitted to the atmosphere. To further the purposes of NEPA, in January 2007 DOE issued a Supplement to the Draft EIS (DOE/EIS-0357D-S1) to correct estimates of CO_2 emissions from the proposed plant that were published in the Draft EIS, to provide additional information regarding CO_2 releases and CO_2-related cumulative impacts, and to further explore the possibility of CO_2 sequestration. On January 12, 2007, a Notice of Availability was published in the Federal Register (72 FR 1710) to invite comments on the Supplement to the Draft EIS. The comment period for the Supplement to the Draft EIS ended on February 27, 2007. The Supplement is included as Appendix E of this Final EIS. Material from the Supplement is incorporated into the Final EIS and all comments on the Supplement to the Draft EIS and corresponding responses by DOE are contained in Appendix F to this Final EIS.

Potential Impacts

Potential impacts that could result from construction and operation of the proposed facilities, as well as potential impacts resulting from the scenario under the no-action alternative, were evaluated in the areas of land use, aesthetics, air quality, geology, water resources, floodplains, wetlands, ecological resources, socioeconomic resources, waste management, human health, and noise. ***Resources and impact areas that could be subject to cumulative impacts when the proposed project is considered along with other existing and reasonably foreseeable future projects are (1) air quality, including hazardous air pollutants and greenhouse gases, (2) water resources and related issues, such as water consumption and water quality, and (3) socioeconomic resources and related issues, such as the flow and safety of vehicular traffic and the effects on water and wastewater services.*** The following sections provide key findings for areas of potential concern related to construction and operation of the proposed facilities.

Land Use and Aesthetics. The proposed main plant would be confined to the area between the existing Gilberton Power Plant and the Mahanoy State Correctional Institution, and thus would not affect offsite land use. ***Approximately 75 acres of deciduous forest would be permanently lost to construct the main plant. About 9.5 acres of land would be required during construction for equipment/material laydown, storage, assembly of site-fabricated components, staging of material, and facilities to be used by the construction workforce (i.e., offices and sanitary facilities). The land for these temporary facilities would be situated within the 75-acre main plant site. A new beneficiation plant (or expansion of the existing facility) in the adjacent valley to the north of the main plant area would probably require about 1 acre of land. In addition, slightly over 1 acre would be cleared from the main plant site to the beneficiation plant and railroad siding to establish a 5,000-ft long, 12-ft wide corridor for new water and product pipelines.*** The ancillary facilities would not affect offsite land use due to their small size (i.e., a few acres) and location adjacent to ancillary facilities for the Gilberton Power Plant. During the first 25 years ***of the 50-***year operating life of the proposed facilities, approximately 1,000 acres of land would be reclaimed after culm removal to provide feedstock for the facilities.

Five 200-ft stacks and one 300-ft stack would be constructed as part of the proposed facilities. The five 200-ft stacks would be considerably shorter than the existing 326-ft stack at the adjacent Gilberton Power Plant, and the 300-ft stack would be slightly shorter. The new gasifier and turbine buildings would be similar in size to the existing power plant buildings. Because the visual landscape of the area is already conspicuously marked with industrial structures, the proposed facilities would not alter the industrial appearance of the site and, accordingly, would not degrade the aesthetic character of the area.

Air Quality. Emissions of air pollutants would be discharged primarily from the five new 200-ft stacks located in the main plant area of the proposed facilities. A computer-based air dispersion model was used to estimate maximum increases in ground-level concentrations of SO_2, nitrogen dioxide (NO_2), particulate matter less than or equal to 10 μm in aerodynamic diameter (PM-10), and carbon monoxide (CO) that would occur at any location as a result of emissions from the stacks. In this analysis, the significance of the maximum predicted concentrations was evaluated using "significant impact levels" (a form of ambient air quality standards, as described below). According to U.S. Environmental Protection Agency (EPA) guidelines, a preliminary modeling analysis using significant impact levels should include only the emissions associated with the proposed facilities to determine if the facilities would have a significant impact on ambient air quality. If the maximum predicted concentrations are less than the significant impact levels, additional modeling, including other sources and background concentrations, is not required.

Initial results indicated that maximum concentrations were predicted to be less than their corresponding significant impact levels, with the exception of the annual NO_2 concentration, which had a value of 1.1 $\mu g/m^3$ versus a significant impact level of 1 $\mu g/m^3$. However, oxides of nitrogen (NO_x) emissions from the proposed facilities would be composed of both NO_2 emissions and nitric oxide (NO) emissions. Because not all NO emissions would convert to NO_2 in the atmosphere, the analysis was refined by relaxing the initial conservative assumption that all NO_x emissions would be in the form of NO_2. The revised maximum annual NO_2 concentration was predicted to be 0.8 $\mu g/m^3$, which is less than the significant impact level of 1 $\mu g/m^3$ for NO_2. ***Therefore, additional modeling including other sources and background concentrations is not required for regulatory purposes for any of the pollutants.***

Maximum concentrations for all pollutants were predicted to occur at the same location, on top of Locust Mountain, slightly over 3 miles north of the main plant area. Concentrations would be negligible at the nearest Prevention of Significant Deterioration (PSD) Class I area (Brigantine Wilderness Area), about 130 miles to the southeast in New Jersey. Dispersion of pollutants at that distance would reduce atmospheric concentrations to a small fraction of the maximum modeled concentrations, which were predicted to be less than PSD Class I increments (standards) at the location of their maximum impact (i.e., on top of Locust Mountain).

To address concerns about potential cumulative impacts from the proposed facilities in conjunction with existing generation and cogeneration facilities (expressed in public comments during scoping and on the Draft EIS), DOE conducted an analysis of potential cumulative impacts to air quality including existing sources and background concentrations (which incorporate other existing sources in the atmosphere). The analysis found that emissions of sulfur dioxide, nitrogen dioxide, particulate matter, and carbon monoxide from six existing sources in addition to the proposed facilities, in combination with background concentrations, would result in air concentrations no greater than 42% of the respective National Ambient Air Quality Standards. Proposed and planned future developments, discussed in Section 6.3, were not included in this analysis because of the nature of the activities (regional distribution centers and wind farms). Their potential air pollutant emissions, including vehicle emissions from increased traffic, are expected to be small in comparison to the proposed facilities, existing power plants, and regulatory thresholds. The proposed biofuels production plant described in Section 6.1.1 has not yet been constructed, and estimates of its air emissions are not available. Consequently, DOE is unable to

quantify the potential contribution of the proposed biofuels plant to air pollutants in the cumulative effects assessment.

Ozone (O_3) is not emitted directly from a combustion source but is formed from photochemical reactions involving emitted volatile organic compounds (VOCs) and NO_x. Because the reactions involved can take hours to complete, O_3 can form far from the sources of its precursors (the VOCs and NO_x that initiate its formation). Therefore, the contribution of an individual source to O_3 concentrations at any particular location cannot be readily quantified. Stack emissions of NO_x from the proposed facilities would be about 70 tons per year, which would be less than 1% of Schuylkill County's NO_x emissions inventory of 8,335 tons per year in 1999, the latest year with an available inventory. Stack VOC emissions would be about 28 tons per year, which would be less than 0.4% of the county's VOC emissions inventory of 7,840 tons per year in 1999. Because the nearest O_3 monitoring station is located in Reading, about 35 miles south-southeast of Gilberton (Section 3.2.2), existing ambient O_3 concentrations in the area are uncertain. The small percentage increases in NO_x and VOC emissions would not be likely to degrade O_3 concentrations sufficiently to cause violations in the O_3 NAAQS, but the magnitude of the degradation cannot be quantified.

Trace emissions of other pollutants would include mercury, beryllium, sulfuric acid mist, hydrochloric acid, hydrofluoric acid, benzene, arsenic, and various heavy metals. As required by the F-T synthesis process, the synthesis gas would be cleaned extensively using wet scrubbing followed by acid gas removal using a Rectisol unit, prior to sending the gas to the F-T synthesis facilities and the combined-cycle power plant. Therefore, a high percentage of hazardous air pollutants and trace elements in the synthesis gas would be removed. Part of the purpose of the proposed project is to generate environmental data, including hazardous air pollutant measurements, from the operation of the integrated technologies at a sufficiently large scale to allow industries and utilities to assess the project's potential for commercial application.

Emissions of hazardous air pollutants (e.g., mercury) from the proposed facilities would likely be very similar to emissions from state-of-the-art integrated gasification combined-cycle facilities due to the similarity in the technologies, including synthesis gas cleanup equipment. Extensive characterization of trace elements during demonstration of a Shell pilot-scale integrated gasification combined-cycle plant from 1987 to 1991 indicated that scrubbing in the synthesis gas cleanup train, upstream of the acid gas removal equipment, was very effective in removing volatile trace elements. Volatile trace elements were not detected in the clean product synthesis gas or the acid gas, with the exception of lead in the clean synthesis gas and selenium in the acid gas, which were present at less than 1% of the total inlet feed rate to the gasifier.

Air Quality Program Permit No. 54-399-034, issued by the Pennsylvania Department of Environmental Protection for the proposed facilities, establishes maximum allowable limits for total facility emissions of less than 10 tons for any single hazardous air pollutant (e.g., mercury) and less than 25 tons for any combination of hazardous air pollutants during any consecutive 12-month rolling period. Although the permitted limits function as a cap to ensure that the proposed facilities would be a minor new source of hazardous air pollutants under the National

Emissions Standards for Hazardous Air Pollutants regulations, the permitted limits for this plant do not reflect the actual expected emissions of hazardous air pollutants. In WMPI's application for Air Quality Program Permit No. 54-399-034, an estimate of 3.7 tons per year was provided for the sum of all hazardous air pollutants (15% of the 25-ton allowable limit). This estimate was based on a worst-case scenario required by the Pennsylvania Department of Environmental Protection (PA DEP). After more detailed analyses, WMPI has estimated that the actual "sum" of hazardous air pollutant emissions would be about 1.5 tons per year. Consequently, the quantity of any single hazardous air pollutant would likely be less than 1 ton per year, which is considerably less than the permitted limit of 10 tons per year. At this time, estimates of the proposed facilities' emissions of individual hazardous air pollutants include 38.6 lb per year of mercury and 2.4 lb per year of arsenic. Total predicted emissions of mercury from the proposed project and other existing and foreseeable emission sources would add less than 1% to the background concentration. Cumulative emissions of mercury, beryllium and arsenic would remain well below respective EPA reference concentrations. No direct threat to human health is expected from air emissions from the proposed project and existing facilities.

Polychlorinated dibenzo(p)dioxin and polychlorinated dibenzofuran compounds (i.e., dioxins and furans) are not expected to be present in the synthesis gas from gasification systems for two reasons. First, the high temperatures in the gasification process would effectively destroy any dioxin/furan compounds or precursors in the feed. (Gasification temperatures within the refractory-lined reactor would typically range from 2,200 to 3,600 ºF, with associated pressures ranging from near atmospheric to 1,200 psi.). Secondly, the lack of oxygen in the reduced gas environment would preclude the formation of free chlorine from hydrochloric acid, thus limiting the potential for chlorination of any dioxin/furan precursors in the synthesis gas. In addition, the temperature profiles where oxygen is present would not be in the favorable range (660 – 1,290 ºF), for production of free chlorine from hydrochloric acid.

Combustion of synthesis gas in a gas turbine would not be expected to lead to formation of dioxin/furan compounds because very little of the particulate matter required for post-combustion formation of these chemicals would be present in the clean synthesis gas or in the downstream combustion gases.

Local residents expressed concern about the potential for odorous emissions of hydrogen sulfide (H_2S). For the proposed facilities, nearly complete H_2S removal from the shifted synthesis gas, occurring in the acid gas removal plant using a Rectisol unit, would be required by the downstream F-T synthesis process. Remaining concentrations would be as low as 1 to 5 ppm. The captured H_2S would be converted to marketable elemental sulfur in a Claus sulfur recovery unit, a process which should remove approximately 99.99% of the sulfur from the recovered acid gas stream. ***Further, the small vent gas streams exiting the Rectisol, Claus, and SCOT units would be sent to a thermal oxidizer to oxidize any trace contaminants prior to being released through a stack to the atmosphere. Because of the high rate of sulfur removal in these units, and the oxidation of the***

small vent gas streams from the units before release to the atmosphere, H_2S odors should not be perceptible.

Local residents also expressed concern about the possibility of emissions from the proposed facilities creating safety issues, such as emissions from the new bank of 12 mechanical-draft cooling towers generating fog that would affect Interstate 81. During occasional meteorological conditions when the atmosphere is nearly saturated, winds are light, and mixing is very low (i.e., during some early morning hours), condensation of water vapor from the cooling towers is possible, which would appear in the form of a cooling tower plume and/or fog. The fog would probably not affect Interstate 81, due to the distance from the proposed site. No fog resulting from existing Gilberton Power Plant operations has been observed on Interstate 81. However, upon initial operation of the proposed facilities, conditions at the interstate would be monitored.

Carbon dioxide emissions to the atmosphere resulting from the operation of the proposed facilities would add about 2,282,000 tons per year to global CO_2 emissions, thus adding to global emissions of CO_2 resulting from fossil fuel combustion, which are estimated to have been 29,000,000,000 tons during the period 2000 to 2005 (IPCC 2007). Emissions from the facilities include CO_2 emitted directly to the atmosphere by facility operations (832,000 tons per year), plus the concentrated CO_2 stream separated in the gas cleanup system (1,450,000 tons per year), which would be emitted at the site. While it was previously anticipated that the concentrated CO_2 stream would be sold as a byproduct, the industrial participant has informed DOE that the commercial sale of the CO_2 would not occur in the foreseeable future. Although not proposed by the applicant, during the 50-year duration of commercial operation, it may become feasible to reduce the project's contribution to global climate change by sequestering some of the CO_2 captured in the process underground. Over the entire fuel lifecycle (from production of the raw material in a coal mine or oil well through utilization of the fuel in a vehicle), production and delivery of liquid transportation fuels from coal has been estimated to result in about 80% more greenhouse-gas emissions than from production and delivery of conventional petroleum-derived fuels (Marano and Ciferno 2001, Williams and Larson 2003, Williams et al. 2006). Recent estimates by EPA of lifecycle emissions are even higher. Based on a conceptual analysis of potential CO_2 capture and sequestration at facilities that produce liquid fuels from coal using technologies similar to those included in the proposed project, it has been estimated that CO_2 sequestration could reduce total fuel-cycle greenhouse gas emissions to 8% more than from the conventional petroleum-derived fuel cycle (as compared to the 80% increase).

Geology. Because the proposed main plant would be built over rock units that do not contain coal, the plant would not be affected by subsidence from mining activities. Product transfer lines and related facilities in the valley of Mahanoy Creek ***would, however, be located over former underground mines and could be subject to subsidence.*** The potential risks of product line leakage due to gradual subsidence would be reduced by inspecting product lines regularly and repairing any problems. ***Also, the facilities' use of water from the Gilberton mine pool would lower the average water level in the mine pool, and thus could reduce stability of the abandoned mine workings below***

Gilberton. However, this would not be expected to increase the likelihood of collapse because water levels would remain within their current range, which has not been observed to increase the possibility of mine roof collapses or other subsidence.

Water Resources. During construction, water quality could be affected by stormwater runoff from construction sites. Standard engineering practices such as silt fencing, straw bales, revegetation of graded areas, and stormwater detention basins would be implemented to control runoff, erosion, and sedimentation. If runoff from the site drained to old strip mining pits on the north or south slopes of Broad Mountain, any ***contained*** sediments would settle out in the pits ***or be filtered by soil and rock as the water*** seep***ed*** to the underlying mine pool. If runoff were directed toward tributaries of Mill Creek, it would be routed through detention basins in which sediments would settle out before the water would be released to a stream. Impacts attributable to construction-related runoff would be minimal.

Construction and operation of the proposed facilities would not change groundwater use on Broad Mountain, but the facilities would increase the area of impervious surfaces. Water that previously would infiltrate the soil to enter the groundwater under Broad Mountain would instead become stormwater runoff and would be discharged to streams or strip mining pits, thus reducing groundwater recharge to the aquifers on Broad Mountain. Estimated recharge within a 1,000-ft radius of the Morea well should remain sufficient to meet the needs of the Morea water system. The wells serving the Gilberton Power Plant are closer to the proposed main plant site than the Morea well is to the main plant site, and thus would be more likely to experience any impacts from reduced recharge. Because other wells in the area are farther from the proposed facilities than the Morea well is from the proposed facilities, they should not be affected by reduced recharge.

All water for use in the facilities would be obtained from the Gilberton mine pool, which consists of water-filled underground mine workings located beneath the borough of Gilberton. During normal operation, the proposed facilities would require an estimated flow of 3,779 gpm from the mine pool, including an estimated 2,744 gpm for cooling water and 1,035 gpm for processing in the main plant. In addition, about 1,667 gpm would be withdrawn for use in culm beneficiation, which includes operation of the existing beneficiation plant. About 2,314 gpm would be consumed in processing or lost to evaporation. About 1,940 gpm (including an estimated average flow of 93 gpm of stormwater collected from the main plant area) would be discharged from the proposed facilities to the tailings pond in the Mahanoy Creek valley as a blend of treated wastewater and uncontaminated water, and about 1,180 gpm would be discharged to the tailings pond as wastewater from culm beneficiation. The effluents discharged to the tailings pond (an average total of about 3,120 gpm) are expected to seep downward into the Boston Run mine pool, which is believed to be inter-connected with the Gilberton mine pool (Parulis 1985). The Susquehanna River Basin Commission authorization for withdrawal of water from the mine pool requires that WMPI seek alternative water sources if a potential is identified for the water level in the Gilberton mine pool to drop to a level below its current range of fluctuation. Possible alternative water sources include other mine pools or a public water supply system; no conflicts

with other water users would be expected. Any alternative source would require Susquehanna River Basin Commission approval and construction of a new water supply line. The proposed facilities' net consumption of water would contribute to the general trend of increased water consumption in the Susquehanna River Basin, adding about 0.7% to consumption as of 2000.

Operation of the proposed facilities would reduce the water volume in the Gilberton mine pool and the volume of water needed to be pumped from the mine pool and discharged to Mahanoy Creek in order to prevent flooding. ***The net effect on water flux in the mine pool system would be a reduction of about 2,225 gpm or 994 million gal per year (assuming operation of the facilities at an 85% capacity factor). This is equal to about 40% of the water volume currently pumped to Mahanoy Creek from the Gilberton mine pool to control the mine pool elevation. This would allow the Commonwealth of Pennsylvania to reduce its pumping of the mine pool by approximately 40%.*** These changes would result in reduced stream flow in ***Mahanoy Creek***. However, the creek would not go dry from receiving less mine pool water because the creek's minimum flows would be maintained by continuous discharges from mine openings in upstream portions of the watershed. Because the stream is not a source of water supply due to its ***seriously impaired water quality due to acidic mine drainage***, reduced flow would not affect water availability.

Project operation would lead to both positive and negative impacts on water quality in both Mahanoy Creek and the mine pool system.

Facility effluents discharged to the mine pool system would return less acidity and dissolved metals to the mine pool system than were contained in the water withdrawn from the mine pool system for use in the facilities, thus improving the quality of the mine pool water with respect to these contaminants. Additionally, reduced pumping from the mine pool (to prevent flooding) would reduce the amount of poor quality water entering the creek from the mine pool. By reducing the amounts of contaminants entering Mahanoy Creek, these changes would assist in meeting state water quality targets for the creek, which has seriously impaired water quality due to acidic mine drainage and does not meet the water-quality objectives established for its designated use as warm-water fish habitat.

Facility effluents could, however, also introduce new contaminants into the mine pool system and subsequently to the stream, thus further degrading the creek as potential habitat for aquatic organisms. Although the facilities' wastewater treatment system would be designed to treat organic residues, in its application for a water permit WMPI's proposal for maximum contaminant concentrations for effluent discharges indicates that effluents from the facilities could contain large residual amounts of organic compounds and other process residues. Toxic and carcinogenic substances, including phenols, cyanides, and polycyclic aromatic hydrocarbons (PAHs) such as pyrene, might be present in low concentrations. Wastewater constituents that are not successfully treated in the wastewater treatment facility are assumed to pass into the creek in the water pumped from the mine pool, although their concentrations could be reduced to an unknown extent by dilution within the mine pool. When mine pool water is pumped into Mahanoy Creek, the biochemical and chemical oxygen demand in the discharged water would deplete dissolved oxygen

in the creek, thus further degrading the creek as potential habitat for aquatic organisms. In the stream, mixing with air and other natural in-stream processes would transform oxygen-depleting contaminants in the creek water, so the adverse effects of oxygen depletion would extend for a limited distance downstream from the discharge point. The region of influence for potential water quality impacts is not expected to extend beyond the Mahanoy Creek watershed. If the quality of discharged water is determined to be unacceptable, additional treatment steps could be incorporated into the proposed wastewater treatment system to reduce adverse impacts to stream water quality. Because the stream is not a source of water supply, water quality changes would not affect human health.

In terms of potential cumulative impacts, other nearby planned and proposed developments (including warehouses, a distribution center, a wind farm, and a corn-to-ethanol plant) are not likely to be important sources of cumulative impacts to water quantity or quality, either because they would have little impact on water resources, their impacts are included in the Susquehanna River Basin Commission's projected trends, or their impacts would occur outside the watershed areas affected by the proposed action.

Floodplains, Flood Hazards, and Wetlands. The main plant would be located at an elevation well above the Federal Emergency Management Agency's delineated 100-year floodplain. A new culm beneficiation plant or expansion of the existing facility in the adjacent valley to the north of the main plant area would also lie above the elevation of the 100-year floodplain. Ancillary facilities that would cross the 100-year floodplain of Mahanoy Creek would be placed atop an existing trestle at an elevation above the level of the 100-year flood. No new construction within the floodplain would be required. ***The Federal Emergency Management Agency flood hazard delineations do not include areas potentially at risk from flooding due to failure of dams or berms. However, staff of the Pennsylvania Department of Environmental Protection have identified a concern that discharge of facility effluents to the tailings pond could increase the potential for berm failure, which would cause flooding in the vicinity of the pond and downstream in Gilberton. The probability and potential consequences of a tailings pond failure at the Gilberton site have not been quantified, but the Gilberton tailings pond appears to be less susceptible to catastrophic failure than other Appalachian region coal mine impoundments whose failures resulted in serious damage. Also, if the pond were to fail, the relatively low land surface slope in the valley would limit the velocity and distance of travel of the pond contents, thus resulting in less severe consequences than could occur in steeper watersheds. The potential for failure of the earthen berm could be reduced, but not eliminated, by discharging facility effluents directly to Mahanoy Creek (bypassing the tailings pond), thus reducing the volume of water managed in the pond. A discharge location would be designated as part of the Pennsylvania Department of Environmental Protection water quality permitting process.***

Construction and operation of the proposed facilities would have no adverse effects on wetlands because none are present on the project site. Runoff and spills from the site would not be expected to reach wetlands due to use of standard construction engineering practices and spill control procedures.

Ecological Resources. Loss of approximately 75 acres of deciduous forest to construct the main plant and 1.5 acres for ancillary structures would affect wildlife species. Other factors associated with construction of the proposed facilities would include increased human activity in the main plant area, increased traffic on local roads, and noise. The presence of construction crews and increased traffic would cause some wildlife species to avoid areas next to the construction site during the 30-month construction period. Burrowing and less mobile species such as amphibians, some reptiles, and some small mammals could be adversely affected during site preparation activities. Construction would temporarily modify the quality of the surrounding habitat in the project area by the creation of noise. No long-term impacts on the hearing ability of wildlife species would be expected from construction-generated noise. Some unavoidable impacts on wildlife would occur as a result of increased vehicular traffic. Construction traffic along the new access road would increase the potential for roadkills for animals such as turkeys, squirrels, and chipmunks.

The loss of deciduous forest during construction would displace some small mammals and songbirds from the construction areas, but would not be expected to eliminate any wildlife species from Broad Mountain because similar habitat is relatively common along and on both sides of the ridge. Clearing for support facilities would create additional forest edge and introduce habitat diversity as these areas partially revegetate. This would tend to benefit edge-related wildlife species, while displacing forest-related species from the new habitat. Over the operating life of the proposed facilities, the terrestrial habitat created on ***more than*** 1,000 acres of reclaimed land after culm removal would offset the 76.5 acres of deciduous forest that would be cleared for the facilities.

Impacts to aquatic habitats and fish from construction and operation of the proposed facilities would be minor to negligible. No surface waters are on or in the immediate vicinity of the proposed project site. Because the proposed facilities would not be located within an area that provides habitat for any protected species except for occasional transient individuals, it is unlikely that any such species would be affected by project construction or operations.

Social and Economic Resources. Construction and operation of the proposed facilities would not result in major impacts to population, housing, local government revenues, or public services in Schuylkill County. Overall, construction of the proposed facilities would have short-term positive effects on employment and income in the east central Pennsylvania region. Project operations would also have positive effects on employment and income and, provided that the demonstration is successful, these effects would last longer than the effects of construction. The project's positive effects on employment and income would contribute to the regional economy.

Schuylkill County and eight of the nine census tracts (small, relatively permanent statistical subdivisions of a county) within 3 miles of the proposed facilities have lower minority percentages than Pennsylvania and the United States. For the remaining census tract, however, significant minority populations reside at the Mahanoy and Frackville State Correctional Institutions. The Mahanoy State Correctional Institution is located 2,600 ft east of the proposed main plant site, and its minority inmate population represents an "environmental justice" population to which the adverse impacts of constructing and operating the proposed facilities could be distributed disproportionately.

However, disproportionately high and adverse air quality, water quality, and health impacts would not be expected because the potential impacts to the prison communities would not be appreciable, with the exception of temporary fugitive dust during construction.

Schuylkill County's population percentage below the poverty level is lower than that of Pennsylvania and the United States. However, two nearby census tracts have poverty rates that exceed those of both Pennsylvania and the United States. The relatively large low-income populations in these tracts represent "environmental justice" populations to which the adverse impacts of constructing and operating the proposed facilities could be distributed disproportionately. However, there would be no disproportionately high and adverse air quality, water quality, and health impacts to these populations.

With regard to transportation, all of the 1,000 workers during the 6-month peak construction period would access the project site from State Route 1008 (Morea Road), and most of these workers would access State Route 1008 from its intersection with State Route 61 in the town of Frackville. This assessment assumed that 1,000 additional vehicle trips (500 to the site and 500 from the site) would be generated each day during the peak construction period, which would represent increases of 10% and 22% over existing traffic on State Route 61 and State Route 1008, respectively. Increases of this size on these roads would likely cause traffic congestion and have an appreciable impact on traffic flow and safety during morning and afternoon commutes. In addition to these construction workers' vehicles, the number of construction delivery trucks accessing the project site from State Route 61 and State Route 1008 would increase. WMPI personnel have committed to contacting the Pennsylvania Department of Transportation to discuss potential mitigation options, including signaling, road widening, and scheduling work hours and/or deliveries to avoid periods of heavy traffic.

During the demonstration and long-term project operations, all of the 250 and 150 workers, respectively, would access the facilities from State Route 1008 (primarily via State Route 61 in Frackville). This assessment assumed that 500 additional vehicle trips (250 to the site and 250 from the site) would be generated each day by workers commuting during the demonstration, while 300 additional vehicle trips (150 to the site and 150 from the site) would be generated each day by workers commuting during long-term operations. Approximately 104 truck trips per day (52 to the site and 52 from the site) would deliver culm to the site, 40 truck trips per day (20 to the site and 20 from the site) would bring limestone, and 22 truck trips per day (11 to the site and 11 from the site) would transport waste material to an offsite landfill. In addition, if liquid fuels produced by the proposed facilities should be shipped by truck rather than rail, about 80 additional vehicle trips would occur daily (40 to the site and 40 from the site). The impacts of operations-related traffic would be less severe than those of construction-related traffic but would be more long lasting. WMPI personnel have committed to contacting the Pennsylvania Department of Transportation to discuss the same potential mitigation options as those available for construction-related traffic.

Once per week, a new supply of empty tank cars would be delivered, and a train of tank cars filled with liquid fuels produced by the proposed facilities would be transported from the site. Rail shipments of this magnitude would not have adverse impacts on the local rail system.

DOE has consulted with the Pennsylvania State Historic Preservation Office (SHPO) regarding the potential for impacts associated with the proposed facilities on any historic resources that may be listed in or eligible for the National Register of Historic Places. Impacts from construction and operation of the facilities would not be likely because the SHPO has identified no such historic or archaeological properties in the project area.

Construction and operation of the proposed project could combine with other ongoing and planned activities, particularly industrial development in the Schuylkill Highridge Business Park and Mahanoy Business Park and possible construction activity to install new turbines at the Locust Ridge Wind Farm, to contribute to cumulative impacts on the area's socioeconomic resources. The proposed project would add the presence of up to 1,000 workers during the 6-month peak construction period.

Waste Management. Because project construction waste quantities would be small in comparison with commercial landfill capacities and waste quantities currently handled at these facilities, landfills in the region should have ample capacity to receive project construction wastes for disposal.

Solid wastes and byproducts generated by the operation of the proposed facilities would include gasifier slag, fine solids, elemental sulfur, and sludges from water and wastewater treatment. Commercial uses would be sought for the gasifier slag, including lightweight construction aggregate, asphalt roofing shingle granules, blasting grit, and pipe-bedding material. However, markets for this material have not yet been established. Any slag that is not used commercially would be used as fill material for surface mine reclamation at and near sites where culm would be obtained. Because the Pennsylvania residual waste management regulations are intended to prevent or reduce the potential for adverse impacts from leaching of wastes, compliance with these regulations would minimize the potential for adverse impacts to water quality from land application of the slag.

Most of the fine solids generated by the proposed facilities would be used as fill material in a permitted ash disposal area on WMPI land as part of mine reclamation, subject to the same residual waste regulations that would govern the slag. The potential for impacts to water quality from using this material in mine reclamation would be larger than from similar use of slag, but compliance with the residual waste regulations would minimize the potential for adverse impacts to water quality. Provided that the residual waste regulations are met, sludges from treatment of raw water and wastewater would also be placed on WMPI land that is permitted for disposal of coal byproducts. The placement of the proposed facilities' solid wastes and byproducts on lands that were previously mined or covered with culm banks would contribute to reclamation of surface-mined lands. Reclamation activities and needs in the vicinity could easily absorb the volume of material that would be generated by the proposed facilities.

If fine solids or sludges from the facilities failed to meet criteria for land application, they would require disposal in an offsite commercial landfill. The additional waste would increase average daily waste volumes at either of the two nearest landfills by more than 10%. However, commercial landfill capacity in the region appears to be sufficient to handle the additional waste volume. Management of the fine solids and sludges would require special clearance from the Pennsylvania Department of Environmental Protection. Special handling might also be required before shipment or within the landfill to control the release of water, which could affect the quantity and characteristics of landfill leachate.

Elemental sulfur would be produced and sold commercially. Because consumption in the United States exceeds domestic production, a market should be available for the elemental sulfur that the proposed facilities would generate.

None of the proposed facilities' solid wastes and byproducts would be expected to be hazardous as defined under the Resource Conservation and Recovery Act (RCRA). The Toxicity Characteristic Leaching Procedure test would be performed to verify this expectation, and any wastes found to be subject to RCRA hazardous waste regulations would be handled in accordance with applicable procedures.

Several wastewater collection and treatment units would be used to manage liquid waste streams. Stormwater collected from process areas and stormwater from parking lots and other portions of the site not used for processing or materials storage would be collected in two separate lined retention basins. Wastewater from the gasification and liquefaction processes would be combined with runoff from process areas in an equalization basin, then routed to a series of oil-water separation units where droplets of oil and grease would be recovered and oily sludge would be collected for disposal or recycling to the gasification process. Effluent from this stage of treatment would be mixed with non-oily wastewater streams and routed to a biological treatment unit that would combine aeration with clarification in order to treat wastewater with high levels of chemical and biological oxygen demand. This unit would be designed to consume the organic compounds and nutrients in the wastewater, yielding treated effluent for discharge and a biological sludge for disposal. Treated effluent would be mixed with non-process-area stormwater in an equalization basin for final settling and testing prior to discharge to a tailings pond in Mahanoy Creek valley.

Potential odor impacts from liquid waste streams would be controlled by treating all process wastewater within enclosed facilities prior to discharge to the final equalization basin. Treatment system upsets (e.g., if fluctuations in wastewater characteristics were to cause a die-off of microorganisms in the biological treatment unit) could result in release of incompletely treated water, causing odor problems and water quality degradation off the site. The potential for upsets could be minimized by designing the system with ample reserve capacity, selecting treatment units that are demonstrated to tolerate a wide range of wastewater characteristics, and controlling inflows to the treatment system to maintain consistent wastewater characteristics. Potential for explosion in oil-water separation units could be minimized by using a nitrogen gas blanket over these units.

Human Health and Safety. A potential health impact to the public would be associated with operational air emissions from the proposed facilities, including criteria pollutants and hazardous air pollutants. However, all maximum ambient concentrations of criteria pollutants from the proposed facilities were estimated to be less than their corresponding significant impact levels, and Air Quality Program Permit No. 54-399-034, issued by the Pennsylvania Department of Environmental Protection for the proposed facilities, establishes maximum allowable limits to ensure that the proposed facilities would be a minor new source of hazardous air pollutants (e.g., mercury).

The proposed facilities would be subject to Occupational Safety and Health Administration standards. During construction, permits would be required and safety inspections would be employed to minimize the frequency of accidents and maximize worker safety. Construction equipment would be required to meet all applicable safety design and inspection requirements, and personal protective equipment would be used, as needed to meet regulatory standards. Operations would be managed from a control room. All instruments and controls would be designed to ensure safe start-up, operation, and shut down. The control system would also monitor operating parameters. The overall design, layout, and operation of the facilities would minimize human hazards. With regard to electromagnetic fields, no perceptible changes would occur because no new transmission line would be built.

While catastrophic accidents would be possible, including accidents involving fire and/or explosion, the probability of such an incident would be remote. ***Both the Shell gasification technology and the Fischer-Tropsch liquefaction technology are commercially available with extensive development histories (20-40 years). No reports of injuries or fatalities to the public from catastrophic or industrial accidents for either of the technologies have been identified.***

Regarding potential accidents associated with transport of the produced liquid fuels from the proposed facilities, a train of filled tank cars would be moved off the site only once per week. Because fuels produced by the facilities would be transported to local distribution centers and/or refineries within a 150-mile radius, a rail accident involving the tank cars would be very unlikely.

Although concerns have been raised about the vulnerability of nuclear power plants to terrorist attack (Behrens and Holt 2005), the potential for such attacks on coal-based power plants has not been identified as a threat of comparable magnitude. Nuclear materials would not be present at the proposed project, but there is the potential for release of hazardous materials in the event of an intentional destructive act (i.e., terrorism or sabotage). The potential consequences of a hazardous materials release from the proposed gasification, liquefaction, or electric generating facilities would be similar to those from accidental causes.

Noise. During construction of the proposed facilities, the principal sources of noise would be from construction equipment and material handling. The amount and type of construction equipment would vary depending on the specific construction activity occurring at the time (e.g., site excavation, structural steel/mechanical/electrical equipment erection and installation, piping, fabrication, etc.). Construction activity would primarily occur within 6 acres of the 75-acre main plant site.

During operation of the proposed facilities, the principal sound sources would include equipment like the combustion turbine/generator, steam turbine/generator, heat recovery systems, turbine air inlets, exhaust stacks, cooling towers, pumps (e.g., feed, circulating, etc.), and compressors. These sound sources would be enclosed and acoustically insulated. Noise sources within the buildings would be fitted with sound-attenuating enclosures or other noise dampening measures.

The proposed project site's highest sound level was measured to be 55 dB(A) under existing conditions. The highest sound level during simultaneous operation of the Gilberton Power Plant and the proposed facilities was estimated by assuming that the sound level generated by the two facilities would be equal. A doubling of sound energy corresponding with operation of both facilities yielded an increase of 3 dB, indicating that the proposed site's highest sound level measurement would be 58 dB(A). A change in sound level of plus or minus 3 dB is the threshold of perception to the human ear.

The center of the proposed main plant would be about 2,600 ft west of the Mahanoy State Correctional Institution. The increase in noise levels (i.e., 3 dB) would probably be imperceptible because of (1) the distance between the prison and the proposed project site, (2) planned noise attenuation measures, (3) natural and man-made terrain features and structures, and (4) the limited period during which the inmates are allowed outside the prison. No perceptible change in noise associated with the proposed facilities would be expected at the nearest residence, located 3,600 ft southeast of the proposed main plant, or other offsite locations.

The applicant has proposed measures to prevent or mitigate many of the potential impacts about which the public expressed concerns (Table 4.2.1). For example, air quality would be protected by dust suppression measures during construction and air pollution control devices to capture contaminants and remove odors during operation. Water quality would be protected by the use of Spill Prevention, Control, and Countermeasures Plan and Best Management Practices Plan. The treatment of process effluents would result in discharges to the tailings pond, Mahanoy Creek, and mine pool that have lower levels of acidity and dissolved metals than presently occur in the mine water, but higher concentrations of other pollutants (e.g., biochemical and chemical oxygen demand). Excavated culm bank areas would be re-graded and vegetation would be re-established. Additional pollution prevention and mitigation measures may be required by permits issued by the Pennsylvania Department of Environmental Protection. Environmental monitoring would be carried out to ensure that the proposed project operates within permit limits. The applicant does not plan to sequester the carbon dioxide produced during operation of the project. The release of carbon dioxide from the proposed facilities would add an estimated 2,282,000 tons per year to global carbon dioxide emissions.

Impacts of Commercial Operation following the Demonstration Period

DOE's assessment of the impacts of the proposed action includes analysis of impacts during the 3-year demonstration that DOE proposes to support, as well as analysis of the potential environmental consequences of continued commercial operation of the facility after the demonstration period.

Commercial operation of the facility following the 3-year demonstration period might require the use of alternative fuels, if all readily available culm has been consumed. Depending on the alternative fuel selected, changes in air emissions, solid wastes and byproducts, and impacts related to acquiring the fuel (including mining, beneficiation, and transportation) would be anticipated.

Over the assumed 50-year operating life of the proposed facilities, continued progress in reclamation of abandoned mine lands in the watershed could reduce the availability of water from the mine pool system and require the establishment of an alternative water supply. Adequate capacity should be available for disposal of facility solid wastes, either for beneficial use, or for mine reclamation or in commercial landfills. If changes in market conditions necessitate the disposal of byproduct elemental sulfur, the material would be acceptable for disposal in a commercial landfill, but treatment or other special handling could be required to prevent adverse impacts. Carbon dioxide emissions could continue at levels projected for the demonstration period. However, during the commercial life of the project it might become feasible to reduce the project's contribution to global climate change by sequestering some of the recovered CO_2 ***underground.***

No-Action Alternative

Under the no-action alternative, DOE would not provide cost-shared funding to demonstrate the commercial-scale integration of coal gasification and F-T synthesis technologies to produce electricity, steam, and liquid fuels. At the site of the proposed project, it is reasonably foreseeable that no new activity would occur. Thus, under the no-action alternative, no construction or operation of the proposed facilities would occur; no site preparation would be required, such as clearing of trees and other vegetation; no employment would be provided for construction workers in the area or for operators of the proposed facilities; and no resources would be required and no discharges or wastes would occur. This scenario would not contribute toward the removal of anthracite culm, which is stacked locally in numerous piles that were set aside during previous mining of anthracite coal.

Because no new activity would occur, current environmental conditions at the site, which are described in Section 3 (Existing Environment), would not change. Specifically, air quality in the area would remain the same, and no changes would occur to existing geologic and soil conditions in the area. No changes would occur to the quantity and quality of surface water and groundwater and the availability of water supplies in the area. Ecological resources would remain the same. No changes would affect the current management of solid and hazardous waste in the proposed project area.

Refer to Table 2.2.1 for a comparison of key potential impacts between the proposed facilities and the scenario under the no-action alternative.