2. THE PROPOSED ACTION AND ALTERNATIVES

This section discusses the proposed action, the no-action alternative, and alternatives dismissed from further consideration.

2.1 PROPOSED ACTION

The proposed action is for DOE to provide cost-shared funding for the design, construction, and demonstration of proposed facilities near ***the borough of*** Gilberton, Pennsylvania, to produce electricity, steam, and liquid fuels from coal waste by integrating coal gasification and Fischer-Tropsch (F-T) synthesis of liquid hydrocarbon fuels (Section 1.3). The proposed action described in the following sections is DOE's preferred alternative.

2.1.1 Project Location and Background

The site for the proposed project is located adjacent to the existing Gilberton Power Plant near the borough of Gilberton ***in the western portion of Mahanoy Township*** in Schuylkill County, Pennsylvania (Figure 2.1.1 and Figure 2.1.2). 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 and 2 miles east of State Highway 61. The city of Pottsville is located about 8 miles to the south of the site. The city of Reading lies 35 miles to the south-southeast, the city of Harrisburg is situated 50 miles to the southwest, and the city of Scranton is located slightly over 50 miles to the northeast. The main plant for the proposed project would occupy about 75 acres of nearly level land owned by WMPI PTY, LLC on top of Broad Mountain. The land is currently an undisturbed forested area, ***except for about 15 acres of the site that WMPI cleared at its own risk in 2006.***

WMPI's Gilberton Power Plant began operation in 1988 and employs about 150 people. The plant generates from two circulating fluidized-bed boilers a total of approximately 80 MW (net) of electricity for the regional power grid and provides 800,000 lb of steam per hour to heat a nearby state prison and to dry coal. As a comparison, if all of the energy were used to generate electricity rather than also providing steam, the power plant would generate about 82 MW (net). The plant annually burns about 640,000 tons of anthracite coal waste (culm) for fuel. Culm consists of rock and coal with varying amounts of carbon material remaining after removal of higher-quality saleable coal. The principal structures of the existing plant, which occupy about 6 acres of the 20-acre cleared site, are the boiler building, turbine building, administration building, raw water treatment building, water storage tanks, circulating water pump house, mechanical-draft cooling towers, baghouses for particulate control, and solid waste silo. The plant provides electricity to the adjacent Hauto-Frackville #3 69kV transmission line. Coal mining and disposal of coal combustion byproducts occur on a portion of the 36,000 acres of WMPI land in the local area. Bottom ash and fly ash from the Gilberton Power Plant are either sold (e.g., for use as road aggregate) or used on WMPI land to restore the contours of land changed by strip mining. The closest railroad siding is about 1 mile away near the borough of Gilberton ***(Figure 2.1.2)***.

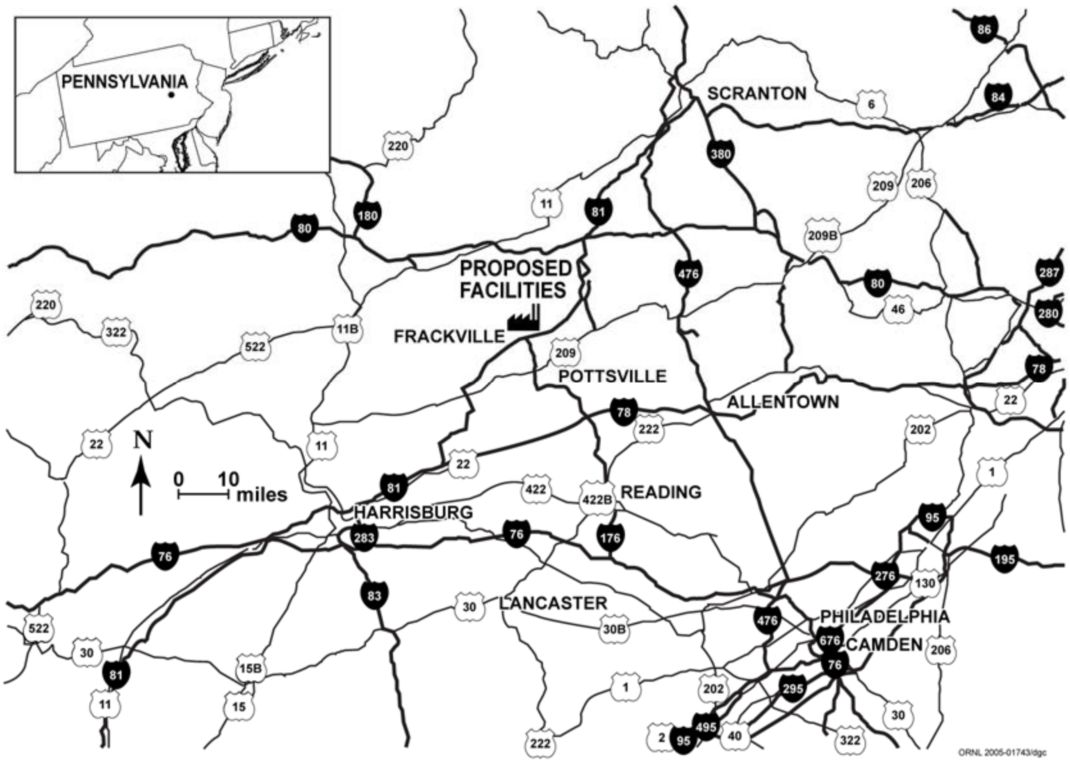

Figure 2.1.1. General location of proposed facilities.

2.1.2 Technology and Project Description

The proposed facilities would use coal waste to produce electricity, steam, and high-quality liquid fuels, including low-sulfur and low-nitrogen diesel fuel and naphtha, by integrating the coal gasification and F-T synthesis technologies. The primary feedstock would be low-cost anthracite culm, which is a locally abundant, previously discarded resource that could accommodate fuel requirements ***during the demonstration period and for some time thereafter. However, according the original proposal, the facilities would also be capable of using a blend of feedstock containing up to 25% petroleum coke. Petroleum coke is a high-sulfur, high-energy product having the appearance of coal. Oil refineries produce petroleum coke by heating and removing volatile organic compounds (VOCs) from the residue remaining after the refining process. Due to the expected effectiveness of the facility's gas cleanup system, if petroleum coke were to be used as part of a blended feedstock to the gasifier, air emissions would not be significantly affected by feedstock composition. As a result, if petroleum coke were used, air emissions would be expected to remain within the permitted levels for criteria pollutants and hazardous air pollutants identified in Section 4.1.2.2. Because of the low ash content of petroleum coke, its use would reduce the facilities' production of gasification slag, but production of byproduct sulfur would increase due to the higher sulfur content of petroleum coke (Appendix G).***

Figure 2.1.2. Location of proposed main plant and ancillary facilities.

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 by tapping into the nearby, existing Hauto-Frackville #3 69kV transmission line. 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, which 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.

Regulated air emissions from the facilities would be small (Section 2.1.6.1), 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 to a combined-cycle power plant, which is part of the proposed project. The use of anthracite culm would ***support*** reclamation of land currently ***occupied by*** culm ***banks***.

The proposed project would provide the first demonstration of integrating the coal gasification and F-T technologies, both of which have been commercially demonstrated individually. 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. One of the objectives of the proposed project would be to demonstrate the economic viability of the integrated technologies. To reduce costs, the project would take advantage of existing local infrastructure, including rail, water, and transmission lines. To accelerate deployment to potential customers, the integrated technologies would include systems that would be adapted easily to construction and operation by utilities and petroleum industries. Figure 2.1.3 displays a generalized diagram of the technologies integrated into the proposed facilities.

The integration of these complex technologies offers potential economic and environmental advantages by allowing byproducts of some processes to be used as feedstock in other onsite processes. While the technology description includes the byproducts that are recycled into other processes, the environmental impacts of operations would result primarily from the energy and materials that enter and exit the overall system. To aid understanding of the proposed facilities and their environmental impacts, Figure 2.1.4 provides a simplified schematic that identifies inputs and outputs associated with major system components. Materials that would be recycled between the major system components are omitted.

2.1.2.1 Gasification Technology

The Shell gasification technology consists of the following six major processes (with subprocesses in parentheses): air separation, feedstock preparation (beneficiation, milling and drying), gasification and cooling (pressurization and feeding, gasification, high-temperature synthesis gas cooling, fine solids removal, scrubbing, sour water stripping), sour water-gas-shift and cooling, acid

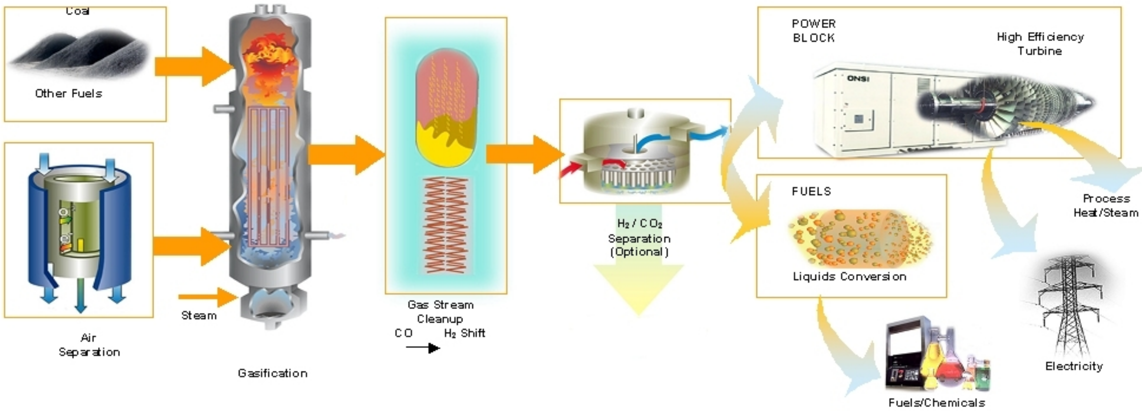

Figure 2.1.3. A generalized diagram of the technologies integrated into the proposed facilities.

gas removal, and sulfur recovery and tail gas treating. The air separation unit would supply high-pressure oxygen (95% purity) to the gasifier and nitrogen (at least 99% purity) for culm feed pressurization and conveying and, if needed, for acid gas removal and other plant services.

To provide a consistent culm feed to the Shell gasification facilities, a new beneficiation plant or expansion of the existing facility in the adjacent valley to the north of the main plant area would be required to remove lower-quality material (e.g., rock) in the culm. The culm (sized as large as 3 ft upon arrival at the beneficiation plant) would be screened mechanically by bars that would tend to exclude the large, break-resistant rock, while allowing the higher-quality material to split and pass between the bars. As with the existing beneficiation plant, a flotation process would subsequently be used to separate the higher- and lower-quality material passing through the mechanical screening. The higher-quality material would be less dense and would tend to float, while the lower-quality material would be denser and would tend to sink. The mechanically excluded rock and lower-quality material separated during flotation would be trucked from the beneficiation plant for reclamation of local coal stripping pits.

After flotation, the higher-quality anthracite culm from the beneficiation plant (sized no greater than 1 in.) would be transported by conveyor belts to the Shell gasification facilities. The culm would be ground and dried to a size suitable for efficient gasification (i.e., no greater than 50 µm). Micronized limestone would be injected into the culm stream in the milling and drying unit from a silo located in the main plant area. A bag filter would limit airborne particles from milling and drying.

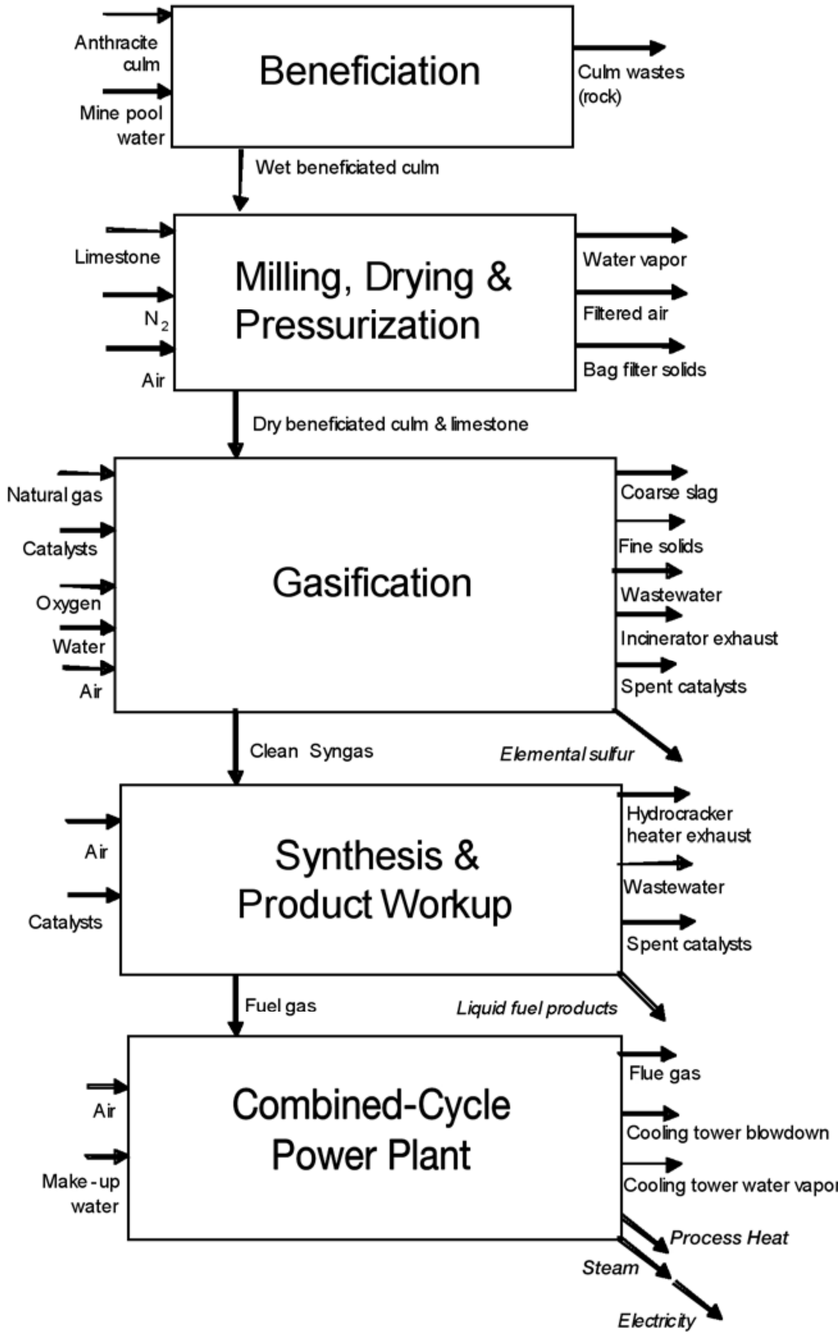

Figure 2.1.4. Simplified schematic that identifies inputs and outputs associated with major system components of the proposed project.

Milled and dried culm and limestone would be transported to the culm pressurization and feeding system by transport screws and rotary feeders. Pressurized culm and limestone would be withdrawn from feed vessels and pneumatically conveyed with nitrogen to the gasifier's burners. The pressurized feedstock and oxygen would enter the gasifier through pairs of opposed burners.

The gasifier would consist of a vessel operating at high temperature (i.e., above 2,700°F) and high pressure (i.e., about 700 lb per square inch) with a water-cooled internal wall chamber. An opening at the bottom of the gasifier would remove slag, and an opening at the top would allow hot synthesis gas and fine solids to exit. Most of the mineral content in the feed would leave the gasifier in the form of molten slag. The high gasifier temperature and limestone would ensure that molten slag flows freely down the reactor wall into a water-filled compartment at the bottom of the gasifier, where the molten slag would be quenched, solidified, and removed. Negligible non-methane hydrocarbons would be present in the synthesis gas because of the high temperature and high carbon conversion (greater than 99%) associated with the Shell gasification technology.

The hot raw synthesis gas leaving the gasification zone would be quenched with cooled, recycled synthesis gas from the synthesis gas cooler to convert any entrained molten slag into a hardened solid material prior to entering the synthesis gas cooler. Heat released during the cooling of the synthesis gas would be recovered by generating steam from water. The fine solids contained in the synthesis gas leaving the cooler would be removed using commercially available filters and sent to a silo for temporary storage prior to final disposal. Synthesis gas leaving the fine solids removal section would be cleaned and cooled further by a wet venturi scrubbing unit, which would remove any residual fine solids to a level of less than 1 ppm and would also remove minor contaminants such as soluble alkali salts and hydrogen halides. Make-up water would be added continuously to the wet scrubbing unit to compensate for evaporative losses and to generate a blowdown stream to control the concentration of contaminants. The contaminated water would be sent to a sour water stripping plant to remove hydrogen sulfide (H_2S), ammonia, and other soluble gases prior to a portion of the water being used as make-up for slag quenching. In the stripping plant, low-pressure steam would provide the necessary heat and stripping medium. Residual solids would be removed and recycled to the culm milling and drying unit. The remaining wastewater from the stripping plant would be combined with other effluents from the facilities and delivered to a new onsite wastewater treatment facility dedicated to the proposed facilities.

The raw synthesis gas leaving the stripping plant would be sent to the sour water-gas-shift facility where the hydrogen-to-carbon monoxide (H_2-to-CO) equilibrium ratio would be shifted. Specifically, a chemical reaction would occur in which a fraction of the CO would be oxidized to form carbon dioxide (CO_2), while steam (H_2O) would be reduced to produce H_2 to increase the H_2-to-CO ratio for optimum F-T synthesis. Prior to F-T synthesis, H_2S would be removed from the shifted synthesis gas in the acid gas removal plant using a Rectisol unit and would be converted to marketable elemental sulfur in a Claus sulfur recovery unit. ***More sulfur compounds would be removed from the synthesis gas by passing the tail gas from the Claus unit through a SCOT (Shell Claus Off-gas Treating) process) unit, which additionally improves the efficiency of the Claus unit.***The Rectisol unit would also recover CO_2 (although not all of the CO_2 produced by the integrated technologies) in a concentrated stream. The off-gas stream exiting the Rectisol unit, as well as the concentrated CO_2 stream would be sent to a thermal oxidizer. Any trace organic contaminants would be oxidized to less noxious elements and compounds prior to release ***of the off-gas and CO_2*** through a stack to the atmosphere, ***together with the concentrated CO_2 stream from the Rectisol unit (see Section 2.1.6)***.

The gasification facilities would process daily about 4,700 tons (dry) of ***beneficiated*** anthracite culm and 430 tons of limestone to generate about 220 million standard ft^3 of synthesis gas consisting primarily of H_2 and CO gases. The facilities would also produce daily about 800 tons of coarse slag and 200 tons of fine solids on a dry basis. The Shell gasification technology has the flexibility to gasify anthracite culm with an ash content of up to 40%.

2.1.2.2 Fischer-Tropsch Technology

The F-T technology consists of the following three major processes: F-T synthesis, product work-up, and effluent water primary treatment. The F-T synthesis plant would consist of a catalyst reduction unit and an F-T synthesis unit. To maintain a constant level of F-T catalyst, the catalyst reduction unit would activate fresh catalyst for use in the F-T slurry reactor to compensate for deactivated catalyst. Pure H_2 and synthesis gas would be required for the catalyst reduction and conditioning operation. The F-T synthesis unit would consist of the F-T slurry reactor and primary product recovery facilities. The synthesis unit would convert the shifted, clean synthesis gas containing H_2 and CO into hydrocarbon products, including wax and hydrocarbon condensate, reaction water, and tail gas (unreacted synthesis gas and light hydrocarbons from F-T synthesis). A portion of the tail gas would be recycled to increase the overall F-T synthesis conversion, while the remainder would be sent to a high-pressure fuel gas system for routing to the combined-cycle power plant.

In the product work-up section, the F-T wax and hydrocarbon condensate streams would be converted into the final products (i.e., diesel fuel and naphtha). The operation would also produce additional light hydrocarbon materials, which would be consumed as fuel within the plant.

The reaction water would be sent to the effluent water primary treatment unit (i.e., a fractionation column). The reaction water would contain a small quantity of oxygenates, including alcohols, ketones, aldehydes, and carboxylic acids, which are byproducts of the synthesis reaction. The effluent water primary treatment unit would remove the non-acid oxygenates prior to treatment of the effluent water at the wastewater treatment facility. Oxygenates would be recycled to the gasification facilities where their energy content would be recovered.

The F-T synthesis facilities would process the 220 million standard ft^3 of synthesis gas to produce approximately 5,000 barrels of F-T liquids per day, of which 3,700 barrels would be diesel fuel and 1,300 barrels would be naphtha. While the proposed plant would be designed to maximize diesel production with naphtha as a byproduct, the plant would have the flexibility to produce different mixes of products.

2.1.2.3 Combined-Cycle Power Plant

The combined-cycle power plant would use the excess fuel gas from the facilities to generate electricity using a gas ***combustion*** turbine and ***two*** steam turbines ***(Figure 2.1.4)***. Steam would be injected into the gas turbine combustor to control oxides of nitrogen (NO_x) emissions by reducing the combustion temperature. Exhaust flue gas from the gas ***combustion*** turbine would be conveyed to a heat recovery steam generator (HRSG) to generate steam for producing additional electricity in ***two*** steam turbines. The total amount of electricity generated would be approximately 133 MW, of which 92 MW would be consumed internally by the proposed facilities and 41 MW would be exported to the regional power grid. Ammonia would be injected into the cooled flue gas to reduce NO_x and CO in a selective catalytic reduction reactor. A stack would then discharge the flue gas to the atmosphere.

2.1.3 Construction Plans

Construction of the proposed facilities would ***take about 2-1/2 years***. Site preparation would include clearing of trees and other vegetation, site leveling and contouring, and construction of onsite roads, parking lots, fences, and stormwater drainage areas. Roads and parking lots would be constructed of asphalt or concrete on a crushed limestone base. Site preparation would also involve construction of load-bearing concrete piers and foundations for heavy and settlement-sensitive structures. Excavation would be performed for footings, grade beams, pits, basements, retaining walls, and catch basins. Topsoil removed during site preparation would be stored in stockpiles and later spread on finished contoured areas. Following site preparation, other phases of construction would include mechanical installation, piping interconnection, electrical installation, and instruments and controls configuration.

Construction materials would consist primarily of structural steel beams and steel piping, tanks, and valves. Locally obtained materials would include crushed stone, sand, and lumber for the proposed facilities and temporary structures such as enclosures, forms, and scaffolding. Components of the facilities would also include concrete, ductwork, insulation, and electrical cable.

Most of the materials would be delivered to the site by truck. A truck loading and unloading area would be built at the main plant site. If economically feasible, shipping by rail would also be an option for heavier components. The closest rail siding is approximately 1 mile away. From the rail siding, the components would be trucked to the site. Special permits and advanced planning would be required.

Large, pre-fabricated equipment (e.g., gasifier, F-T reactor) would likely be transported by ship or barge to the USX facility at Fairless Hills, Pennsylvania, on the Delaware River about 90 miles southeast of the proposed site. At the facility, the load would be transferred to truck for transport to the site. The USX facility is experienced with handling heavy loads and would be a viable option as part of optimizing highway routes and obtaining permits.

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. An average of about 50 vehicles would be used for construction activities on the site.

Land requirements during construction and operation are discussed in Section 2.1.5.1.

2.1.4 Operational Plans

After mechanical checkout of the proposed facilities, demonstration (including performance testing and monitoring) would be conducted over a 3-year period ***following the completion of construction***. The project would demonstrate high-capacity operation and reliability of the facilities. About 250 workers would be required during the demonstration, of which approximately 150 would be plant operators with the remaining employees a mix of craft workers, managers, supervisors, engineers, clerical workers***, and others temporarily assigned to the site to test equipment and gather data***. An average of about 50 vehicles would be used for operational activities on the site.

The truck loading and unloading area would be capable of handling all liquid fuels and byproducts generated by the proposed facilities, as well as required materials such as catalysts and chemicals. However, the liquid fuels are planned to be shipped from the facilities solely by rail.

If the demonstration is successful, commercial operation would follow immediately (Section 5). About 150 workers would be required for long-term operations. The facilities would be designed for a lifetime of ***50*** years, including the 3-year demonstration period.

2.1.5 Resource Requirements

Table 2.1.1 summarizes the operating characteristics, including resource requirements, for the proposed facilities.

2.1.5.1 Land Area Requirements

Figure 2.1.5 displays a preliminary layout of the proposed 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 adjacent to the truck loading area within the southeast quadrant of the 75-acre main plant site.

The 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. The corridor would accommodate (1) a new water supply pipeline transporting mine pool water from the existing pump house, (2) two new product pipelines transporting naphtha and diesel fuel to holding tanks in the railroad car loading area, and (3) possibly a new culm feed conveyor, which would traverse adjacent to the existing conveyor. All of these proposed items would be installed above ground. Similarly, about 0.5 acres would be cleared for a 2,000-ft by 12-ft path along which a new, aboveground wastewater line would run by gravity flow from the main plant site to an existing tailings pond to the north. About 0.4 acres would be cleared for a 1,500-ft by 12-ft corridor in which a new, buried natural gas line would run to the main plant site

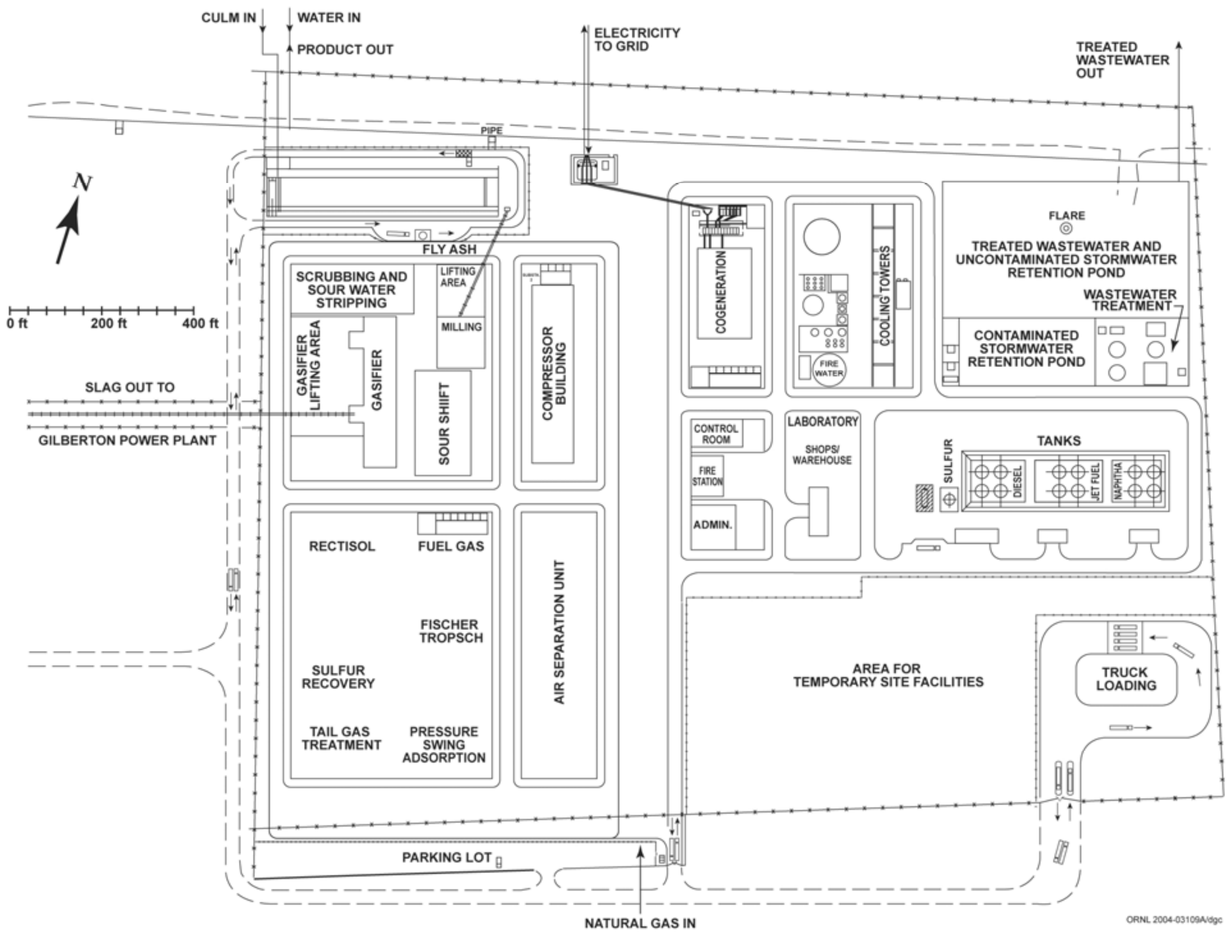

Figure 2.1.5. Preliminary layout of proposed main plant.

from the existing connection to the south. A minimal amount of land would be required for a new, 300-ft above-ground line to tap into the existing Hauto-Frackville #3 69kV transmission line immediately to the north of the main plant site. During operation, the land used previously for construction staging and lay down at the main plant site would be used for parking and other purposes.

2.1.5.2 Water Requirements

Water would be used during construction of the proposed facilities for various purposes including personal consumption and sanitation, concrete formulation, preparation of other mixtures needed to construct the facilities, equipment wash down, general cleaning, dust suppression, and fire protection. Water would be obtained from the Gilberton mine pool (a man-made aquifer resulting from a network of voids produced during underground mining activities) (Section 3.4.3). The water would be purified to a potable quality using demineralization and reverse osmosis at the main plant site as part of the

Table 2.1.1. Anticipated operating characteristics of the proposed facilities

Basic data	
Size of main plant site	75 acres
Capacity factor [a]	85%
Production capacities	
Liquid fuels	
Diesel fuel	3,700 barrels/day
Naphtha	1,300 barrels/day
Electricity	
Consumed internally	92 MW
Exported	41 MW
Byproducts	
Surplus steam	0 lb/hour [b]
Elemental sulfur	4,000 tons/year
Resource consumption	
Anthracite culm ***(beneficiated)***	***1,468,000*** tons/year [b]
Petroleum coke	0 tons/year [b]
Limestone	134,000 tons/year
Methanol	11,400 gal/year
Sulfuric acid	5,000 gal/year
Ammonia	3,200 gal/year
Natural gas	17,000,000 BTU/hour[c]
Water	
Cooling tower make-up water	2,744 gpm
Water supply to main plant[d]	1,035 gpm
Water supply to beneficiation plant(s)	1,667 gpm

[a] Capacity factor is 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.

[b] Based on the most likely operational scenario, including using anthracite culm alone.

[c] ***Assuming 85% capacity and a constant rate of gas consumption during full operation, this equates to 127 billion BTU/year or 123 million ft^3 (mcf) of natural gas at 1,031 BTU/ ft^3. Because the rate of gas consumption would not be constant, actual annual consumption would be less.***

[d] ***Includes 4 gpm for potable water supply.***

Table 2.1.1. Anticipated operating characteristics of the proposed facilities (continued)

Effluents	
Air emissions[e]	
Sulfur dioxide (SO_2)	29 tons/year
Oxides of nitrogen (NO_x)	70 tons/year
Particulate matter (PM)	23 tons/year
Carbon monoxide (CO)	54 tons/year
Volatile organic compounds (VOCs)	28 tons/year
Hazardous air pollutants	<10 tons/year (individual) <25 tons/year (combined)
Ammonia	<100 tons/year
Sulfuric acid mist	<15 tons/year
Carbon dioxide (CO_2) ***from thermal units***	832,000 tons/year
Carbon dioxide (CO_2) from Rectisol unit	***1,450,000 tons/year***
Wastewaters	
Effluents from intake water treatment[f]	***479*** gpm
Process streams[g]	***332*** gpm
Cooling tower blowdown	877 gpm
Boiler blowdown and process condensate[h]	***159 gpm***
Contaminated stormwater runoff (annual average flow)[i]	***44 gpm***
Sanitary wastewater	4 gpm
Solid wastes	
Coarse slag (dry basis)	250,000 tons/year
Fine solids (dry basis)	62,500 tons/year
Iron sludge (dry basis)	3,400 tons/year
Wastewater treatment sludge	4,000 tons/year
Spent iron-based ***F-T*** catalysts	***810*** tons/year
Reprocessable spent catalysts, adsorbents, and resins from production or water treatment	***4,400 ft^3/year***
Reprocessable spent adsorbents from instrument air drying	***2.5 tons/year***
Anthracite/sand filter material	***275 ft^3/year***
F-T precoat material	***1550 ft^3/year***
Spent filter cartridges from air, water, or hydrogen processing	***110 units/year***

[e] Potential-to-emit annual emissions included in the air permit application submitted to the Pennsylvania Department of Environmental Protection were slightly greater because those emissions included other sources such as fugitive dust from facility vehicles traveling on roads. Specifically, those annual emissions were listed as 34 tons of SO_2, 72 tons of NO_x, 49 tons of PM, 64 tons of CO, and 33 tons of VOCs.

[f] ***Includes water treatment purges from treating mine pool water for use in the cooling tower (110 gpm), as well as reverse osmosis purges (360 gpm) and demineralizer regeneration wastes (9 gpm) from treating mine pool water for in-plant use.***

[g] ***Includes stripped sour water (28 gpm), F-T wastewater (124 gpm), Rectisol purge water (36 gpm), gasifier purge (106 gpm), and plant water return (38 gpm). These wastewater streams would be treated in the onsite wastewater treatment facilities.***

[h] ***Includes polisher regeneration wastewater (6 gpm), recovery condensate purge (110 gpm), and boiler blowdown (43 gpm).***

[i] ***Estimated from average annual precipitation and the size of the area contributing contaminated runoff. Onsite wastewater treatment facilities would be designed to treat contaminated runoff at a rate of 151 gpm.***

plant process water system. Potable water use during construction would average about 1 gpm. Portable toilets would minimize requirements for additional sanitary water.

During operation, all water for process and potable needs would be drawn from the Gilberton mine pool. ***A combined total of about 1,667 gpm of mine pool water would be used in the flotation process to prepare culm for the new facilitie****s and* ***the existing Gilberton Power Plant. About 29% of this water (an average of 487 gpm) would be retained in culm delivered to the proposed facilities or to the existing Gilberton Power Plant, but the majority (about 1,180 gpm) would be*** transported by pipeline to an existing tailings pond (Figure 2.1.2) for percolation back to the ***underlying*** mine pool ***system***. About ***1,035*** gpm would be withdrawn for process and potable water needs at the main plant site and would be purified to a potable quality using demineralization and reverse osmosis at the main plant site. Table 2.1.2 itemizes the process water requirements for the proposed facilities. ***Figure 2.1.6 provides a graphical summary of facility water use and effluents.*** Process water consumed at the main plant site would total about ***557*** gpm, primarily from (1) moisture loss in the wet slag and fines byproducts, (2) reaction losses to produce hydrogen in the gasification facilities, and (3) reaction losses to produce additional hydrogen in the sour water-gas-shift facility. Most of the remaining used process water would be treated in the wastewater treatment plant, conveyed to a synthetic-lined retention pond, and transported by a gravity-flow pipeline to the tailings pond. Potable water needs during operation would be about 4 gpm.

A closed-loop cooling water system would be installed to meet the cooling requirements of the gasification facilities, F-T synthesis facilities, and the combined-cycle power plant. The cooling system would feature a bank of 12 mechanical-draft cooling towers with 6 operating circulation pumps plus a spare to deliver a total circulation rate of 120,000 gpm. About 2,744 gpm of make-up water would be drawn from the mine pool to compensate for evaporation and blowdown from the cooling towers. Because the mine pool water is acidic with a high level of iron, aeration and pH adjustment would be required to remove the iron and improve the water quality to an acceptable level for use in the cooling towers. About ***two-thirds*** of the ***cooling water*** would ***be lost to*** evaporation, while nearly all of the remaining amount would be blowdown discharged from the cooling towers to the wastewater treatment plant for the purpose of controlling the level of total dissolved solids in the cooling water. About 1 gpm of water droplets would escape beyond the cooling towers' drift water eliminators to the atmosphere. Chemicals for biocide and corrosion inhibition would be injected into the circulating and make-up water.

As detailed in Table 2.1.2, on average a total of 5,446 gpm (7.8 million gal/day) would be withdrawn from the mine pool to support operations of the proposed facilities. (This total includes the continuation of an ongoing withdrawal of water for beneficiation of culm for the existing Gilberton Power Plant.) A total of 2,314 gpm (3.3 million gal/day) would be consumed in processing or by evaporation, and 3,027 gpm (4.4 million gal/day) would be discharged to the tailings pond.

Table 2.1.2. Water balance for the proposed facilities (flow rates in gpm) *[Extensively revised since Draft EIS]*

	Coal beneficiation[a]		Production facilities		Cooling towers		Totals
Input	Pumped from mine pool	1,667	Pumped from mine pool	1,035	Pumped from mine pool	2,744	**5,446**
			Contained in beneficiated coal	386[b]			
			Total water input	1,421			
Output			**Water consumption, transfers, and losses**				
	Contained in beneficiated coal supplied to new facilities	386[b]	Boiler feedwater deaerator vent	0.4	Evaporation and drift loss	1,757	
			Gas turbine steam injection	161			
	Contained in beneficiated coal supplied to Gilberton Power Plant	101	Net process consumption and losses	372			
			Plant consumption[c]	24			
	Total transfers outside new facilities	101					**101**
			Total consumption and losses	557	*Total consumption and losses*	1,757	**2,314**
			Discharge to tailings pond				
	Coal beneficiation plant wastewater	1,180	Mine pool water treatment (reverse osmosis) purges	360	Mine pool water treatment purge	110	
			Demineralizer regeneration wastes	9	Cooling tower blowdown	877	
			Stripped sour water	28			
			F-T wastewater	124			
			Rectisol purge water	36			
			Gasifier purge	106			
			Polisher regeneration wastewater	6			
			Recovery condensate purge	110			
			Boiler blowdown	43			
			Plant water return[c]	38			
	Total discharge to tailings pond	1,180	*Total discharge to tailings pond*	860	*Total discharge to tailings pond*	987	**3,027**[d]
			Discharge to septic system				
			Sanitary wastewater	4			**4**
	Total water output	1,281[b]	Total water output	1,421	Total water output	2,744	**5,446**

[a] Values for beneficiation include water requirements and discharges of the existing beneficiation plant as well as additional beneficiation capacity that would be built to supply the proposed facilities.

[b] Water contained in beneficiated coal delivered to the production facilities (386 gpm) is accounted for under outputs from the production facilities and, therefore, is not included in the total for water outputs from coal beneficiation.

[c] Revised by WMPI since submission of water quality management permit application (WMPI 2005c).

[d] Discharge to tailings pond would also include 93 gpm (annual average basis) of stormwater runoff from the area of the proposed facilities.

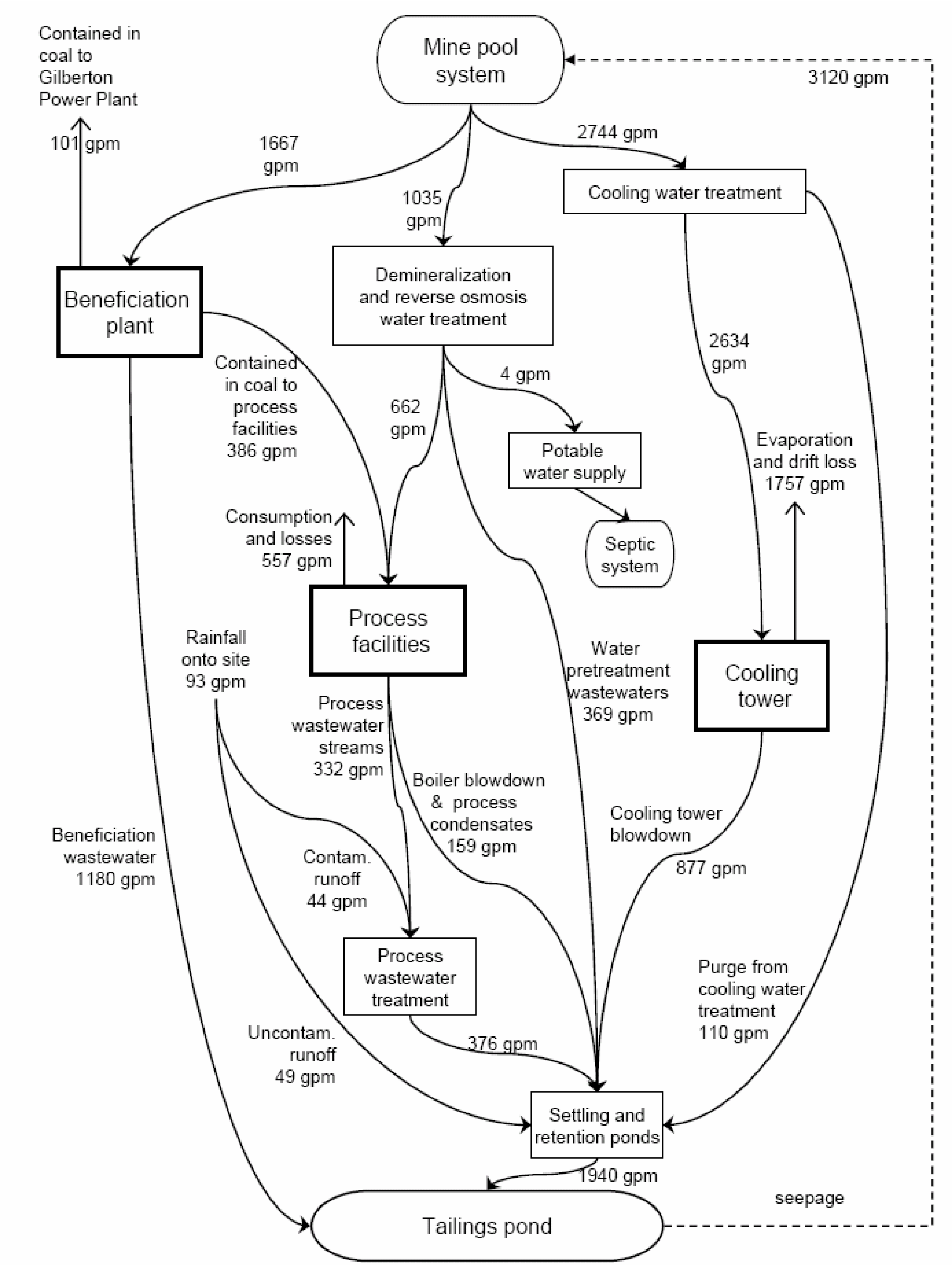

Figure 2.1.6. Summary water balance for the proposed facilities, including water sources, uses, and effluents (annual average flows in gpm).

2.1.5.3 Fuel and Other Material Requirements

The primary feedstock for the proposed facilities would be anthracite culm, which is abundantly available locally. Much of the culm is ***deposited on the landscape*** in piles that were ***created*** during previous mining of anthracite coal because the quality of the culm was insufficient to sell it at the time. ***Authoritative estimates are not available for the total quantity of potentially recoverable anthracite culm remaining on the land surface in eastern Pennsylvania, but the quantity is considered to be very large. A conservative estimate of the amount of locally available culm available to WMPI is 100 million tons (equivalent to about 25 million tons of beneficiated culm).*** All of the culm would be suitable feedstock for the proposed facilities. The heating value of the culm averages about 5,500 Btu/lb prior to beneficiation and 8,340 Btu/lb after beneficiation, as compared to an average of about 11,000 Btu/lb for freshly mined anthracite coal. The gasification facilities would process daily about 4,700 tons (dry) of anthracite culm with 430 tons of limestone used as a flux, which would be added to the feedstock in the culm milling and drying unit to lower the ash melting temperature of the culm and promote fluidity. The proposed facilities would also be capable of using a blend of feedstock containing up to 25% petroleum coke (Section 2.1.2 ***and Appendix G***). Table 2.1.3 presents ***a comparison*** of the composition of beneficiated anthracite culm and petroleum coke.

Table 2.1.3. *Comparison* of the composition of anthracite culm and petroleum coke

Characteristic	Beneficiated anthracite culm	Petroleum coke	
		Sample 1	Sample 2
Heating value, Btu/lb (dry basis)	8,340	14,191	15,251
Analysis, percent by weight [a]			
Moisture	1.9	11.7	0.4
Carbon[b]	54.4	88.6	85.9
Hydrogen	1.7	1.8	3.9
Nitrogen	0.7	1.7	1.3
Sulfur	0.3	6.2	5.4
Ash	40.0	0.7	1.8
Oxygen	2.9	1.0	1.7
Chlorine	--	--	--

[a] Because the analysis was conducted on a dry basis for all constituents except moisture, the sum of percentages for all constituents excluding moisture equals 100% in each column.

[b] ***The carbon content of the non-ash component is similar for all three samples. Considering only the non-ash component, carbon content is 90.7% for beneficiated anthracite culm and 89.2% and 87.5% for the two samples of petroleum coke.***

Source: WMPI PTY, LLC

The culm would be trucked from the surrounding local area to the beneficiation plant. The limestone would be trucked in micronized form (i.e., the milling would be conducted at the limestone quarry) from mines within 100 miles of the project site, probably from a quarry at Herndon, Pennsylvania, located about 35 miles west of the site. If used by the proposed facilities during commercial operation following the demonstration period, petroleum coke would be delivered by truck or rail from undetermined locations outside of the local area. The culm, limestone, and petroleum coke would be unloaded at the beneficiation plant, truck unloading area, or railroad car unloading area, as appropriate.

About 11,400 gal of methanol would be used annually as a solvent for the Rectisol process. About 5,000 gal per year of sulfuric acid would be used for processing and wastewater treatment. About 3,200 gal per year of ammonia would be used for selective catalytic reduction in the combined-cycle power plant to reduce NO_x and CO in the flue gas. These chemicals would be trucked to the truck unloading area.

A new, buried line would deliver natural gas to the main plant site from the existing connection about 1,500 ft to the south. The natural gas would be used as fuel to incinerate (1) tail gas from the Rectisol unit in a thermal oxidizer and (2) vented fumes from the truck loading and unloading area in a thermal incinerator.

2.1.6 Outputs, Discharges, and Wastes

Table 2.1.1 includes a summary of discharges and wastes for the proposed facilities.

2.1.6.1 Air Emissions

Based on a plant operating rate of 7,500 hours per year (an 85% capacity factor), air emissions from the proposed facilities would total less than 100 tons per year for each of the criteria pollutants. SO_2 emissions would be about 29 tons per year, NO_x emissions would be about 70 tons per year, particulate emissions would be about 23 tons per year, and CO emissions would be about 54 tons per year. VOC emissions would be about 28 tons per year (see footnote b of Table 2.1.1 for potential-to-emit annual emissions included in the air permit application submitted to the Pennsylvania Department of Environmental Protection). Trace emissions of other pollutants would include mercury, beryllium, sulfuric acid mist, hydrochloric acid, hydrofluoric acid, benzene, arsenic, and various heavy metals, which are not yet quantified but for which an air quality permit has been issued by the Pennsylvania Department of Environmental Protection with annual limits to ensure that the proposed facilities would be a minor new source of the pollutants (Section 4.1.2.2). ***The proposed facilities would also produce about 2,282,000 tons per year of CO_2 (Radizwon 2006), which would be released to the atmosphere. Carbon dioxide is a greenhouse gas that is generally regarded by a large body of scientific experts as contributing to global warming and climate change (IPCC 2001, IPCC 2007). Although not proposed by the applicant, during the 50-year duration of commercial operation it may become feasible to reduce the proposed project's contribution to global climate change by sequestering some of the CO_2 underground.***

Air emissions would be vented continuously from five 200-ft stacks and flared infrequently from a 300-ft emergency ***main flare*** stack. The ***five main stacks consist of a CT/HRSG stack, a hydrocracker reactor stack, a hydrocracker fractionator, a heater stack, a SRU/TGTU thermal oxidizer stack, and the product loading vent thermal oxidizer stack.*** The ***300-ft*** emergency stack would flare quenched, raw synthesis gas from the gasifier during start-ups and during unexpected shut-downs, such as during loss of power or loss of cooling water. ***There are also five baghouse stacks, one stack for the emergency main flare, one stack for an emergency engine, and one stack for a carbon adsorption unit.***

2.1.6.2 Liquid Discharges

Most of the water processed through the proposed facilities would be classified as wastewater that would require treatment at the new onsite wastewater treatment facility prior to discharge to a tailings pond and seepage back to the ***underlying*** mine pool ***system***. No wastewater would be discharged to surface waters. The wastewater treatment plant, which would be located in the northeastern corner of the main plant area (Figure 2.1.5) and dedicated to the proposed facilities, would receive all waste streams from the process areas and rainfall runoff considered contaminated. The plant would remove oil, sludge, and other organic compounds from the water using an oil/water separator, air flotation unit, and biological reactor, and would neutralize the water to a pH of 7. Oil recovered by the oil/water separator would be directed to a used oil storage tank and ultimately removed by a contractor for recycling and/or disposal. About ***332*** gpm of liquid effluent from process sources, including F-T wastewater, gasifier purge water, Rectisol (acid gas removal) purge water, ***stripped sour water, and in-plant water return (e.g., wash water), would be treated in the onsite wastewater treatment facilities, together with rainfall runoff from process areas (design flow of 151 gpm, average annual flow of 44 gpm). Additionally, about 479*** gpm of effluent from initial treatment of mine pool water, 877 gpm of cooling tower blowdown, and **159** gpm of other blowdown water ***and process condensates would be stored in settling basins and blended with wastewater treatment facility effluents and stormwater runoff*** before discharge to the tailings pond ***(Figure 2.1.6)***. ***Table 2.1.4 lists WMPI's proposal for maximum contaminant concentrations for effluent discharges to the tailings pond. WMPI based these requested effluent limits on existing NPDES discharge permits for petroleum refining operations and electric power generating stations in Pennsylvania.***

Table 2.1.4. Proposed concentration limits for NPDES discharge permit for the proposed facilities

Contaminant	*Proposed Limit (mg/L, except as indicated)*	
	Monthly (average, except as indicated)	*Maximum (daily value, except as indicated)*
pH (range; pH units)	*6-9 (range)*	*--*
Oil and grease	*15*	*30 (instantaneous value)*
Chlorine, free	*--*	*0.2*
Chromium, total	*--*	*0.36*
Zinc	*--*	*1.56*
Ammonia nitrogen (NH_3-N)	*22*	*47*
Biochemical oxygen demand, 5-day	*40*	*70*
Chemical oxygen demand	*275*	*530*
Phenolic compounds	*0.2*	*0.5*
Sulfide	*0.2*	*0.5*

Source: Chandran 2005.

Rainfall runoff from the uncovered process plant areas (areas without roofs) would be considered contaminated ***for at least the first hour of any storm event*** and would drain via a segregated collection system of buried pipes and open ditches to a synthetic-lined stormwater retention pond prior to treatment. The retention pond would be sized at a 2,000,000-gal capacity, ***which would*** accommodate ***3.9 inches of rainfall runoff from the 19 acres of uncovered process areas, thus providing sufficient capacity for the 3.76 in. of precipitation estimated to result from a 100-year 2-hour storm or the 3.84 in. of precipitation estimated to result from a 1000-year 1-hour storm (Bonnin et al. 2004).*** The wastewater treatment facility would ***have capacity*** to process contaminated rainfall runoff ***from the pond at a rate of 151 gpm***, in addition to the continuous waste streams associated with operation of the facilities. After treatment, the wastewater would be conveyed to a larger synthetic-lined retention pond sized at a ***11,000,000***-gal capacity.

Rainfall runoff from uncontaminated process plant areas (areas with roofs) and non-process plant areas (e.g., parking lots and outdoor storage areas) would be classified as uncontaminated and would drain by another set of buried pipes and open ditches directly to the larger retention pond. Some process plant areas would contain retention dikes with two independent valves to allow plant maintenance personnel to determine whether the stormwater should be directed to the wastewater treatment plant or could bypass the treatment plant. In the larger retention pond, uncontaminated rainfall runoff would combine with uncontaminated process water and treated wastewater. The blended streams would subsequently be transported by a gravity-flow pipeline to the existing tailings pond for percolation back to the mine pool, with the rate of discharge to the tailings pond being controlled by the retention pond. Suspended solids included in the effluent would be trapped within the tailings pond and would not percolate to the mine pool.

Either a new septic system or an addition to the existing septic system for the Gilberton Power Plant would be constructed for management of sanitary wastewater and sewage. The septic system would be designed for continuous operation at a capacity of 4 gpm.

2.1.6.3 Solid Wastes *and Byproduct Materials*

Construction

During construction of the proposed facilities, land preparation activities would include clearing, grubbing, stripping, excavation, and placement of fill to establish approximate grading elevations. All trees, stumps, roots, vegetation, rubbish, and other unsuitable material would be removed to a depth of 3 ft below the existing grade or below the final grade, whichever would be greater. Reusable topsoil and soil containing organic material would be stored in stockpiles and later overlaid on finished grading areas.

Potential construction waste could include metal scraps, electrical wiring and cable, surplus consumable materials (e.g., paints, greases, lubricants, and cleaning compounds), packaging materials, and office waste. However, much of these materials would be retained in the operating stores warehouse for future use, and the recyclable paper would periodically be collected and transferred to environmental-waste recycling facilities. Metal scraps unsuitable for the operating stores warehouse would be sold to scrap dealers, while the other remaining materials would be collected in a dumpster and periodically trucked off the site by a waste management contractor for disposal in a licensed landfill. The volume of metal scrap would be no more than one dumpster per month during the period of peak scrap generation, with less generated during the first six months and last three months of construction.

Packaging materials and nonmetal components broken during installation would be collected in dumpsters for offsite disposal. The largest volume of solid waste requiring disposal would be packaging material, including wooden pallets and crates, support cradles used for shipping of large vessels and heavy components, and cardboard and plastic packaging. The rate of generation for packaging waste would be up to two truckloads per month (about 18 yd^3 or 18 tons per month) during construction. The volume of broken components would be much smaller.

No hazardous waste generation is anticipated during construction. If any hazardous waste, as defined under the Resource Conservation and Recovery Act (RCRA), is generated incidental to project construction, quantities would be small. Such waste would be handled in accordance with standard procedures currently employed at the Gilberton Power Plant.

Operation

During operation, the proposed facilities would consume anthracite culm as feedstock from operating mines and/or from land ***containing*** culm ***banks,*** covering about 1,000 acres in Schuylkill County (where the facilities would be located) and the adjacent Northumberland County to the northwest. Based on an 85% capacity factor ***and a design-basis assumption that beneficiated culm would contain 20% ash***, coal gasification byproducts would include about 250,000 tons per year of coarse slag and 62,500 tons per year of fine solids (dry basis). These ***quantities would approximately double, if the facilities processed culm with 40% ash content. These*** wastes would generally be managed wet, which would approximately double the weight of the waste material. The anticipated characteristics of the coarse slag and fine solids are displayed in Table ***2.1.5. Because of the low ash content of petroleum coke, its use would reduce the facilities' production of gasification slag (Appendix G).***

Table *2.1.5*. Expected characteristics of coarse slag and fine solids generated by the use of culm in the proposed facilities

	Coarse slag	Fine solids
Ash, wt%	48.2	44.5
Carbon, wt%	1.8	5.5
Water, wt%	50.0	50.0
Particle diameter (nominal), inch	0.25	0.002
Bulk density, dry, lb/ft^3	38.6	NA[a]
Bulk density, wet, lb/ft^3	76.9	NA

[a]Not available
Source: WMPI PTY, LLC

During gasification, molten slag would flow freely down the reactor wall into a water-filled compartment at the bottom of the gasifier vessel, where the molten slag would be quenched, solidified, and removed. The ***solidified*** slag would be crushed and discharged as a wet mixture. ***Specific decisions on the subsequent management of the slag and other project residues would be consistent with Pennsylvania Department of Environmental Protection residual waste regulations (Section 7.2).*** Coarse slag would be sold as a marketable byproduct to the extent possible. If the slag were sold, the moisture would be drained prior to shipment of the slag by truck or rail (the slag could be transported by conveyors to the vicinity of the railroad siding about 1 mile away, near the borough of Gilberton). If no markets were found, the slag would probably be used for restoration of sites where culm was removed or in other local mine reclamation. The fine solids would ***either be fed back into the gasifier as a supplemental fuel, or*** trucked to the adjacent valley to the northeast for placement in ***an*** area on WMPI land ***that*** is permitted for disposal of coal ***ash*** as part of mine reclamation ***(Section 3.8)***. Disposal would move to other previously mined areas as needed to accommodate the fine solids ***and other residues***.

About 3,400 tons per year of iron sludge extracted during the purification of water from the mine pool and about 4,000 tons per year of dewatered wastewater treatment plant sludge would be trucked to the adjacent valley to the northeast for placement in the permitted ash disposal area on WMPI land. As with the fine solids, disposal would move to other previously mined areas as needed.

Elemental sulfur produced in a Claus sulfur recovery unit as a result of H_2S removal from the shifted synthesis gas would be trucked off the site to be sold as a byproduct. ***Production of byproduct sulfur is estimated at about 4,000 tons per year, assuming 0.3% sulfur content in the beneficiated culm (Table 2.1.3).***

Process wastes would also include various spent catalysts, adsorbents, resins, and filtration materials used in the process facilities or in raw water treatment. About 810 tons per year of spent iron-based catalysts from the F-T synthesis technology would need to be replaced periodically. These would either be returned by truck to the manufacturer for regeneration, or used as a flux in the gasifier. Approximately 2.5 tons per year of spent adsorbents and 4,400 ft^3 per year of other spent catalysts, absorbents, resins, and filtration materials would be returned to their

manufacturers for regeneration or other processing. Anthracite/sand filter material from water treatment (about 275 ft^3 per year), F-T pre-coat material (about 1550 ft^3 per year), and spent filter cartridge units from air, water, and hydrogen processing (totaling about 110 units per year) would be sent to a municipal solid waste landfill.

In addition to process wastes, solid wastes generated during facility operation would include used office materials and packaging materials. The disposition of these items would be similar to that discussed previously for these materials during the construction period.

2.1.6.4 Toxic and Hazardous Materials

Operation of the proposed facilities would involve potentially toxic or hazardous materials and wastes generated during operation, including waste paints, solvents, oils, and empty material containers. ***All solid wastes, including these materials, would be evaluated (and tested as necessary) to determine whether they are hazardous as defined under the Resource Conservation and Recovery Act.*** Hazardous wastes generated during operation would be removed from the site by a waste management contractor at regular intervals and trucked to authorized facilities for disposal. ***Management of any hazardous wastes generated as a result of processing*** of spent catalysts***, absorbents, resins, and filtration materials at a manufacturer's offsite facility*** would be ***the responsibility of the owners and operators of the facilities where the materials were processed.***

The facilities would implement a program to reduce, reuse, and recycle materials to the extent practicable. All light bulbs would be treated as hazardous waste and transported to properly licensed facilities for disposal. The facilities would have a Spill Prevention, Control, and Countermeasures (SPCC) Plan (40 CFR Part 112) addressing the accidental release of materials to the environment.

2.1.7 Summary Characteristics of the Proposed Action

Table 2.1.6 summarizes some key characteristics of the proposed facilities in comparison with the existing Gilberton Power Plant.

2.2 ALTERNATIVES

Section 102 of NEPA requires that agencies discuss the reasonable alternatives to the proposed action in an EIS. The term "reasonable alternatives" is not self defining, but rather must be determined in the context of the statutory purpose expressed by the underlying legislation.

Congress established the CCPI Program with a specific goal — to accelerate commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States. ***The CCPI legislation (Pub. L. No. 107-63) has a narrow focus in directing DOE to demonstrate technology advancements related to coal-based power generation designed to reduce the barriers to continued and expanded use of coal. Technologies capable of producing any combination of heat, fuels, chemicals, or other use byproducts in conjunction with power generation were considered; however, coal is required to provide at least 75% of the fuel for power generation. DOE's purpose in considering the proposed action (to provide cost-shared***

Table 2.1.6 Summary comparison of some key operating characteristics for the existing Gilberton Power Plant and the proposed facilities

	Existing Gilberton Power Plant	Proposed facilities
Land area (main plant)	20 acres	75 acres
Employees (operations)	150	250 during demonstration; 150 thereafter
Tallest stack	326 ft	300 ft
Anthracite culm utilization	640,000 tons per year	1,468,000 tons per year
Electricity production (net power for export)	80 MW	41 MW
Surplus steam production for export	800,000 lb/hr	None
Liquid fuels production	None	5,000 barrels/day
Air emissions (tons/year)[a]		
Criteria air pollutants		
Sulfur oxides (sulfur dioxide)	1600	29
Nitrogen oxides	260	70
Particulate matter (PM-10)	32	23
Particulate matter (PM-2.5)	5	
Carbon monoxide	362	54
Volatile organic compounds (VOCs)	32	28
Hazardous air pollutants		<25 combined total
Formaldehyde	0.0072	
Hydrochloric acid	76.63	
Lead	0.0066	
Mercury	0.04	
Ammonia	0.2957	<100
Water supply requirements		
Coal beneficiation (from mine pool)	up to 1,500 gpm	1,667 gpm (including existing Gilberton Power Plant)
Cooling water make-up (from mine pool)	up to 1,400 gpm	2,744 gpm
Process water and potable water	about 44 gpm (from well)	1,035 gpm (from mine pool)
Consumptive water use	up to 1,050 gpm	2,314 gpm
Wastewater discharge	1,300 gpm (to tailings pond); tailings pond also receives an undetermined volume from beneficiation plant	1,947 gpm (to tailings pond); also 1,080 gpm from beneficiation plant (including existing uses)
Principal solid waste and its management	Coal ash, used beneficially for construction aggregate, anti-skid material for roads, and fill material for mine reclamation	Gasification slag (250,000 tons/year), used beneficially for commercial applications or as fill material in mine reclamation

[a]For the existing Gilberton Power Plant, values are 2005 emissions as reported to Pennsylvania Department of Environmental Protection (http://www.dep.state.pa.us/efacts/); values for criteria pollutants are rounded to the nearest ton. For the proposed facilities, values are those included in the permit application submitted to Pennsylvania Department of Environmental Protection, except for hazardous air pollutants and ammonia, which are the maximums allowed under the facility permit (Air Quality Program Permit No. 54-399-034).

funding) is to meet the goal of the program by demonstrating the viability of the proposed project (the integration of coal gasification and F-T synthesis technologies to produce electricity, steam, and liquid fuels). Other technologies that cannot serve to carry out the goal of the CCPI Program (e.g., natural gas, wind power, conservation) are not relevant to DOE's decision of whether or not to provide cost-shared funding support for the Gilberton Coal-to-Clean Fuels and Power Project, and therefore, are not reasonable alternatives.

The CCPI Program only allows for joint funding of proposed projects that have been selected through a solicitation and negotiation process. In 2002, DOE issued the first round CCPI solicitation. Private sector participants submitted proposals in response to the solicitation. A group of proposals, representing diverse technologies and using a variety of coals, was selected to further the goals of the CCPI Program. DOE's choices were limited by virtue of having to choose from the proposals that were submitted under the solicitation process. The proposed project was selected under the first round of the CCPI Program because of the opportunity to demonstrate the specific technologies proposed: the integration of coal waste gasification and Fischer-Tropsch (F-T) synthesis of liquid hydrocarbon fuels at commercial scale. Other projects that proposed to demonstrate other technologies are not alternatives to the proposed project for NEPA purposes.

Congress not only prescribed a narrow goal for the CCPI Program, but also directed DOE to use a process to accomplish that goal that would involve a more limited role for the Federal government. Instead of requiring government ownership of the demonstration project, Congress provided for cost-sharing in a project sponsored by the private parties, with the provision for repayment of the public funds invested. Therefore, rather than being responsible for the siting, construction and operation of the projects, DOE has been placed in the more limited role of evaluating CCPI project applications to determine if they meet the CCPI Program's goal. It is well established that an agency should take into account the needs and goals of the applicant in determining the scope of the EIS for the applicant's project. When an applicant's needs and goals are factored into the deliberations, a narrower scope of alternatives may emerge than would be the case if the agency is the proprietor responsible for all project-related decisions.

2.2.1 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. Without DOE participation, it is possible the proposed project would be canceled, and if it were, the proposed technology may not be demonstrated elsewhere. Consequently, eventual commercialization of the integrated technologies would probably not occur because utilities and industries tend to use known and demonstrated technologies rather than unproven technologies.

At the site of the proposed project, it is reasonably foreseeable that no new activity would occur. WMPI would not construct and operate the proposed facilities. Accordingly, no employment would be provided for construction workers in the area or facility operators. No electricity, steam, or liquid fuels would be produced by the proposed facilities. No resources would be required and no ***new*** discharges, ***emissions,*** or wastes would occur. No anthracite culm would be removed from piles in the local area for use by the proposed facilities. No change in current environmental conditions at the site would result. The adjacent Gilberton Power Plant would continue to operate without change. This scenario would not contribute to the CCPI Program goal of accelerating commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States.

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

Table 2.2.1. Comparison of key potential impacts between the proposed facilities and the no-action alternative

Resource	Impacts of the proposed facilities	Impacts of the no-action alternative
Land use and aesthetics	The locations of the proposed main plant and ancillary facilities would not affect offsite land use. Over ***the first half 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. Because the visual landscape is already conspicuously marked with industrial structures, the proposed facilities would not alter the industrial appearance of the site and would not degrade the aesthetic character of the area.	Offsite land use would not be affected. No additional structures would be built. Impacts would remain unchanged from existing conditions.
Air quality	Modeling results based on emissions from the proposed facilities predicted that maximum concentrations would be less than their corresponding significant impact levels. Concentrations would be negligible at the nearest Prevention of Significant Deterioration (PSD) Class I area (Brigantine Wilderness Area). The small percentage increases in VOC and NO_x emissions would not be likely to degrade local or regional air quality sufficiently to cause violations in the O_3 standards, but the magnitude of the degradation cannot be quantified. Limits stated in the authorized permit would ensure that the proposed facilities would be a minor new source of hazardous air pollutants. Because nearly complete H_2S removal from the shifted synthesis gas would be required by the downstream F-T synthesis process, odorous emissions of H_2S should not be perceptible. ***The proposed facilities would also produce about 2,282,000 tons per year of*** CO_2***, which would be released to the atmosphere.***	No additional air emissions would occur. Impacts would remain unchanged from existing conditions.

Table 2.2.1. Comparison of key potential impacts between the proposed facilities and the no-action alternative

Resource	Impacts of the proposed facilities	Impacts of the no-action alternative
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.***	Impacts would remain unchanged from existing conditions.
Ecological resources	Loss of approximately 76.5 acres of deciduous forest to construct the main plant and ancillary structures would affect wildlife species. Over the long term, the terrestrial habitat created on reclaimed lands from which culm would be obtained would offset the loss of deciduous forest. Impacts to aquatic habitats and fish from construction of the proposed facilities would be minor to negligible because no surface waters are on or in the immediate vicinity of the proposed project site. ***Depletion of dissolved oxygen in Mahanoy Creek due to contaminants in wastewater from operations would, however, hinder the restoration of aquatic life in the creek.*** 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.	No clearing of trees or other vegetation would be required. Impacts would remain unchanged from existing conditions.

Table 2.2.1. Continued

Resource	Impacts of the proposed facilities	Impacts of the no-action alternative
Water resources	Impacts attributable to construction-related runoff would be minimal. Because the facilities would increase the area of impervious surface on Broad Mountain, water that previously would infiltrate the soil to enter the groundwater under Broad Mountain would instead be included in the wastewater discharge to Mahanoy Creek valley, thus reducing groundwater recharge to the aquifers on Broad Mountain. Estimated recharge ***closer to*** the Morea well should***, however, continue to be more than*** sufficient to meet the needs of the Morea water system, and other wells farther away from the proposed facilities should not be affected. 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. These changes would result in reduced stream flow in the 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. Discharge of treated effluent to the mine pool ***system*** by seepage from the tailings pond would be expected to improve the ***quality of*** mine pool ***water with respect to*** concentrations of acidity and dissolved metals ***associated with acid mine drainage, but would introduce additional process-related contaminants. Reductions in the volume of water pumped from the mine pool to Mahanoy Creek and in concentrations of mine-related contaminants would contribute toward meeting total maximum daily load targets for these contaminants, but added contaminants resulting from facility operations would continue to degrade the creek as potential habitat for aquatic organisms.***	No changes in water requirements or discharge of effluents would occur. Impacts would remain unchanged from existing conditions.
Floodplains, flood hazards, and wetlands	The main plant and a new culm beneficiation plant or expansion of the existing facility would be located 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 100-year floodplain. No new construction within the floodplain would be required. ***It is possible that discharge of facility effluents to the tailings pond could increase the potential for berm failure, causing flooding in the vicinity and downstream in Gilberton. However, 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, and 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.*** Construction and operation of the proposed facilities would have no adverse effects on wetlands because none are present on the project site.	No floodplains or wetlands would be affected. Impacts would remain unchanged from existing conditions.

Table 2.2.1. Continued

Resource	Impacts of the proposed facilities	Impacts of the no-action alternative
Socioeconomic 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. With regard to environmental justice, one nearby census tract has significant minority populations residing at the Mahanoy and Frackville State Correctional Institutions. Disproportionately high and adverse impacts to these populations ***are*** not expected because air quality impacts would not be appreciable with the exception of temporary fugitive dust during construction. Similarly, for two nearby census tracts that have relatively high poverty rates, disproportionately high and adverse impacts to these populations ***are*** not expected. Increases in traffic during project construction would likely cause congestion and have an ***adverse effect*** on traffic flow and safety during morning and afternoon commutes. 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. Although the impacts of additional operations-related traffic would be less severe than those during construction, they would ***last longer.*** WMPI personnel have committed to contacting the Pennsylvania Department of Transportation to discuss the same potential mitigation options. Impacts on historic or archaeological properties would not be likely because the State Historic Preservation Office has identified no such properties in the project area.	No employment would be provided for construction workers in the area or for operators of the proposed facilities. Impacts would remain unchanged from existing conditions.
Waste management	Solid wastes and byproducts generated during operations would be sold, used for mine reclamation, or transported to an offsite commercial landfill for disposal***, in compliance with Pennsylvania residual waste management regulations.*** None of these materials 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. ***Spent catalysts, absorbents, resins, and filtration materials would be returned to their manufacturers for regeneration or other processing. Management of any hazardous wastes generated in this processing would be the responsibility of the manufacturer and would utilize the capacity of existing licensed treatment, storage, or disposal facilities.*** Wastewater from the gasification and liquefaction processes would be combined with stormwater 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. 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.	No changes would result to the current management of solid and hazardous waste in the proposed project area. Impacts would remain unchanged from existing conditions.

Table 2.2.1. Concluded

Resource	Impacts of the proposed facilities	Impacts of the no-action alternative
Human health and safety	Regarding operational air emissions, all maximum ambient concentrations of criteria pollutants from the proposed facilities were estimated to be less than their corresponding significant impact levels, and the air permit 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 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. No perceptible changes in electromagnetic fields would occur because no new transmission line would be built. The probability of a catastrophic accident associated with the facilities, including transportation of liquid fuels off the site, would be very unlikely. ***A Risk Management Plan and Emergency Response Program would be used to identify potential hazards and to develop process controls, procedures, and evacuation plans for inmates, employees, and nearby residents. The potential consequences of a terrorist attack resulting in the release of hazardous materials from the proposed gasification, liquefaction, or electric generating facilities would be similar to those from accidental causes.***	Impacts would remain unchanged from existing conditions.
Noise	During operations, the increase in noise levels (i.e., 3 dB) would probably be imperceptible at the Mahanoy State Correctional Institution 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 inmates are allowed outside the prison. No perceptible change in noise associated with the proposed facilities would be expected at the nearest residence or other offsite locations. ***Increased construction- and operation-related traffic will increase the frequency, but not the levels of noise along transportation corridors.***	No additional noise would be generated. Impacts would remain unchanged from existing conditions.

2.2.2 Alternatives Dismissed from Further Consideration

The following sections discuss alternatives, including alternative sites and technologies that were initially identified and considered by DOE or the project participant. The project as proposed meets the needs outlined in the CCPI solicitation that was issued by DOE in March 2002 (Section 1.2). Factors considered in DOE’s project selection process included the desirability of projects that collectively represent a diversity of technologies, utilize a broad range of U.S. coals, and represent a broad geographical cross-section of the United States. Otherwise, DOE did not constrain the proposals with regard to site or technology.

The proposals included responses to a DOE environmental questionnaire (Section 1.5). The responses contained discussions of the site-specific environmental, health, safety, and socioeconomic issues associated with each project. Based on the evaluation criteria discussed in Section 1.2, including consideration of environmental implications, DOE selected 8 projects, including the proposed project, for possible cost-shared financial assistance.

2.2.2.1 Alternative Sites

No other sites to host the proposed project were seriously considered by WMPI PTY, LLC and its project partners. The site needed to closely meet the project's technical needs and easily integrate with existing infrastructure (e.g., roads, railroad siding, electrical transmission lines). An existing plant site or site adjacent to an existing plant site would avoid the additional cost associated with construction of facilities and infrastructure at an undeveloped, remote site, and the environmental impacts likely would be much greater at a site without existing infrastructure. The geographical area considered for the proposed site was limited by the economic and environmental advantages resulting from using nearby piles of anthracite culm, the primary feedstock for the proposed facilities. Because WMPI's Gilberton Power Plant is adjacent, the site proposed for the facilities by the participant was an obvious choice. Based on the above considerations, other sites are not reasonably foreseeable alternatives and are not evaluated in this EIS.

2.2.2.2 Alternative Technologies

Other technologies have been dismissed as not reasonable. ***DOE selected*** the proposed project to demonstrate the integration of coal gasification and F-T synthesis technologies to produce electricity, steam, and liquid fuels. The use of other technologies and approaches that are not applicable to coal (e.g., natural gas, wind power, solar energy, and conservation) would not contribute to the CCPI Program goal of accelerating commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States.

2.2.2.3 Other Alternatives

Other alternatives, such as delaying or reducing the size of the proposed project, have been dismissed as not reasonable. Delaying the project would not result in any change of environmental impacts once the project ***was*** implemented**,** but would adversely ***affect the CCPI Program goal and adversely*** delay reclamation of land currently ***occupied by*** culm ***banks***. The design size for the proposed project was selected because it is sufficiently large to show potential customers that the integrated technologies, once demonstrated at this scale, could be applied commercially without further scale-up. A demonstration indicating that the performance and cost targets are achievable at this scale would convince potential customers that the integration of these technologies is not only feasible but economically attractive (Section 1.4).