APPENDIX G

COMPARISON OF THE POTENTIAL IMPACTS OF PETROLEUM COKE AND ANTHRACITE CULM USE AT THE PROPOSED GILBERTON COAL-TO-CLEAN FUELS AND POWER PROJECT

Comparison of the Potential Impacts of Petroleum Coke and Anthracite Culm Use at the Proposed Gilberton Coal-to-Clean Fuels and Power Project

The primary feedstock for the proposed Gilberton Coal-to-Clean Fuels and Power Project would be low-cost anthracite culm, which is a locally abundant, previously discarded resource that could accommodate fuel requirements during the demonstration period. Culm reserves controlled by WMPI are estimated to be sufficient to supply the proposed facilities for about 15 years, or to supply both the proposed facilities and the existing Gilberton Power Plant for about 11 years. Based on the applicant's 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. This appendix compares some of the potential impacts of 100% anthracite culm use with the potential impacts from using a blended feedstock of 75% anthracite culm and 25% petroleum coke. Topics considered include carbon dioxide emissions, air emissions of sulfur compounds and toxic substances, solid wastes and byproduct production, and increased truck traffic.

Carbon Dioxide (CO_2) Emissions

Published values for potential CO_2 emissions from anthracite and petroleum coke are very similar. According to DOE's Energy Information Administration (EIA 2007), combustion of petroleum coke emits 225.13 pounds of CO_2 per million Btu, compared to 227.40 pounds of CO_2 per million Btu for anthracite coal. Similarly, ICF Inc. (1999) estimated the carbon content of fossil fuels in its Table 1.4-3. Carbon content coefficients were reported as 61.4 and 62.1 lbs of carbon/million Btu for petroleum coke and anthracite coal, respectively. The table below presents published values for carbon content in these fuels in units of pounds of CO_2 per million Btu, together with values presented in this EIS.

Source	Potential CO_2 emissions (lb CO_2 per million Btu)	
	Petroleum coke	Anthracite
EIA (2007)	225.1	227.4
ICF Inc. (1999)	225.1	227.7
Environment Canada	232.8	NA
EIA (1994)	NA	227.4 (Pennsylvania anthracite)
Table 2.1.3 of this EIS	206.5 and 228.8	239

These values support the conclusion that the use of a blended feedstock containing anthracite culm and up to 25% petroleum coke would not significantly change the CO_2 emissions from the proposed project. Also, the value for potential CO_2 emissions from anthracite culm that was used in the Section 4 of this EIS analysis is the highest value for any fuel reported in any of the cited sources, indicating that the EIS analysis of CO_2 emissions is conservative with respect to emissions from the primary feedstock.

Sulfur

Using anthracite culm as the primary feedstock to the proposed facilities, at least 13 tons per day of byproduct elemental sulfur would be produced and sold commercially. However, petroleum coke contains substantially more sulfur than anthracite culm (the sulfur contents of coke and culm are 5.8% and 0.3% by weight, respectively, as given in FEIS Table 2.1.3).

The proposed gas cleanup system would remove nearly all of the sulfur, whatever the feedstock to the proposed facilities. As described in Section 4, 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 of H_2S 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 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 sulfur removal rates in these units and the oxidation of gases vented from them, H_2S odors should not be perceptible at and beyond the project boundaries.

Metals and Other Toxic Impurities

Petroleum coke composition varies with the source. However, because petroleum coke is produced from the heaviest fraction of petroleum, it typically concentrates the heavy metals found as trace impurities in petroleum, with the result that it may have higher levels of heavy metals than culm (Uhde 2007). Toxic polyaromatic hydrocarbons (PAHs) also are cited as an environmental concern associated with petroleum coke (Basabe 2006).

PAHs in the feedstock are expected to be destroyed during gasification. Industry experience with gasification indicates that most heavy metals in feedstock are collected in slag. However, fluxant additions may need to be adjusted to ensure that heavy metals are incorporated into slag. Also, some impurities can build up in the gasifier and adversely affect equipment and catalyst life (Trapp et al. 2004).

Any impurities that remain in the gas would be removed by the Rectisol process and other gas cleanup steps (Sasol Technology Inc., 2007). There is extensive industry experience with the Rectisol process, which was developed in the 1950s. However, Tennessee Eastman also uses activated carbon to remove mercury from gas produced at its Kingsport, Tennessee gasifier (Trapp et al. 2004).

Solid Wastes and Byproducts

Any change in fuel type is likely to affect the composition of the facilities’ slag and other solid wastes and byproducts. Thus, use of petroleum coke likely would necessitate a new evaluation of the management of these materials, including suitability of the slag for beneficial use. For example, if the use of petroleum coke increased the potential for heavy metals to be released from slag, this could change the potential for adverse impacts from slag management and could necessitate changes in regulatory requirements for the management of slag produced by the proposed project.

As noted in Section 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.

Transportation Impacts

If used by the proposed facilities, petroleum coke would be delivered by truck or rail from undetermined locations outside of the local area. Like the culm and limestone, petroleum coke would be unloaded at the beneficiation plant, truck unloading area, or railroad car unloading area, as appropriate.

The routes used in the delivery of petroleum coke and the change in transportation impacts (if any) compared to those associated with the delivery of culm are not known.

Because petroleum coke has a higher sulfur content than culm, additional sulfur byproduct would be produced from the blended feedstock. This would result in additional truck trips to haul the sulfur offsite. It is estimated in Section 4.1.7.8 that 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, 22 truck trips per day (11 to the site and 11 from the site) would transport waste material to an offsite landfill, and 2 truck trips per day (1 to the site and 1 from the site) would transport sulfur from the site. The use of petroleum coke as an additional feedstock could increase sulfur transportation requirements by as many as 7 round trips per day.

The estimate of up to 7 round trips per day to remove the sulfur byproduct from petroleum coke use is conservative in that it assumes that petroleum coke would be 25% of the facility feed by weight and that the same feedstock throughput by weight would be retained. Petroleum coke has a much higher energy content per unit weight than anthracite culm (FEIS Table 2.1.3); thus, if the rate of feedstock throughput is based on energy content rather than weight, use of petroleum coke would result in less additional sulfur production than estimated here.

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