6. CUMULATIVE EFFECTS

This chapter discusses potential impacts resulting from other facilities, operations, and activities that, in combination with potential impacts from the proposed project, might contribute to cumulative impacts. Cumulative impacts are impacts on the environment that result from the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future actions, regardless of the agency (federal or non-federal) or person that undertakes such other actions (40 CFR 1508.7). An inherent part of the cumulative effects analysis is the uncertainty surrounding actions that have not yet been fully developed. CEQ regulations provide for the inclusion of uncertainties in the EIS analysis, and state that "(w)hen an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking" (40 CFR 1502.22). Consequently, the analysis contained in this chapter includes what could be reasonably anticipated to occur given the uncertainty created by the lack of detailed investigations to support all cause and effect linkages that may be associated with the proposed project and the indirect effects related to construction and long-term operation of the facilities.

Because cumulative impacts accumulate as to a specific resource area, the analysis of impacts must focus on particular resources or impact areas as opposed to merely aggregating all of the actions occurring in and around the proposed facilities and attempting to form some conclusions regarding the effects of the many unrelated impacts. Narrowing the scope of the analysis to resources where there is a likelihood of reasonably foreseeable cumulative impacts supports the goal of the NEPA process: "to reduce paperwork and the accumulation of extraneous background data" and "emphasize real environmental issues and alternatives" (40 CFR 1500.2[b]). The resources and impact areas that were identified with a likelihood of cumulative impacts include: (1) atmospheric resources, including CO_2 emissions contributing to global climate change; (2) surface water resources; (3) ground water resources and related withdrawal issues; (4) social and economic resources and related traffic congestion issues; (5) environmental justice issues; and (6) other issues. The lack of significant impacts to some other resources by the proposed project combined with the absence of any other known or anticipated events or effect linkages precludes the need to address other resources in this cumulative effects analysis.

Each resource analyzed has an individual spatial (geographic) boundary, although the temporal boundary (time frame) can generally be assumed to equal the 40-year life expectancy of the proposed facilities.

6.1 ATMOSPHERIC RESOURCES

6.1.1 AIR QUALITY

For air quality, the dispersion modeling analysis in Subsection 4.2.1.2 indicates that maximum predicted concentrations would be greater than the SILs for all criteria pollutants except CO. For CO the SILs could be used as thresholds for determining the potential for cumulative impacts under NEPA. For SO_2, NO_2, and PM_{10}, additional modeling, including other sources and background air quality concentrations, was performed. These detailed analyses addressed other emissions sources well beyond the predicted areas of impact for the proposed project and also added background concentrations to address other sources not otherwise accounted for. These analyses demonstrated that no air quality standards or PSD air quality increments would be exceeded (see Tables 4.2-4 and 4.2-5). The highest total impacts, including other sources and background air quality, for SO_2, NO_2, and PM_{10}, were equal to 12.5, 18.0, and 52.0 percent of their respective NAAQS, respectively. (Total impacts relative to $PM_{2.5}$ NAAQS were also estimated but were due almost entirely to ambient levels and not predicted impacts due to project facilities.) In addition, no other future projects that would constitute new major sources of air emissions are known to be in development (MDEQ, 2009e). Consequently, adverse cumulative air quality impacts from the proposed Kemper County IGCC Project facilities, existing sources, and other sources that might be constructed in the foreseeable future, would not be expected.

6.1.2 CLIMATE CHANGE

Background—A worldwide environmental issue is the likelihood of changes in the global climate as a consequence of global warming produced by increasing atmospheric concentrations of GHGs (International Panel on Climate Change [IPCC], 2007a). The atmosphere allows a large percentage of incoming solar radiation to pass through to the earth's surface, where it is converted to heat energy (infrared radiation) that is more readily absorbed by GHGs such as CO_2 and water vapor than incoming solar radiation. The heat energy absorbed near the earth's surface increases the temperature of air, soil, and water.

GHGs include water vapor, CO_2, methane, nitrous oxide, ozone, and several chlorofluorocarbons. The GHGs constitute a small percentage of the earth's atmosphere. Water vapor, a natural component of the atmosphere, is the most abundant GHG. The second-most abundant GHG is CO_2, which remains in the atmosphere for long periods of time. Due to man's activities, atmospheric CO_2 concentrations have increased approximately 35 percent over preindustrial levels. Fossil fuel burning, specifically from power production and transportation, is the primary contributor to increasing concentrations of CO_2 (IPCC, 2007a). In the United States, stationary CO_2 emission sources include energy facilities and industrial plants. Industrial processes that emit these gases include cement manufacture, limestone and dolomite calcination, soda ash manufacture and consumption, CO_2 manufacture, and aluminum production (EIA, 2009a).

In the preindustrial era (before 1750 A.D.), the concentration of CO_2 in the atmosphere appears to have been in the range of 275 to 285 ppm (IPCC, 2007a). In 1958, C.D. Keeling and others began measuring the concentration of atmospheric CO_2 at Mauna Loa in Hawaii (Keeling *et al.*, 1976). The data collected by Keeling's team and others since then indicate that the amount of CO_2 in the atmosphere has been steadily increasing from approximately 316 ppm in 1959 to 386 ppm in 2008 (NOAA, 2009). This secular increase in atmospheric CO_2 is attributed almost entirely to the anthropogenic activities noted previously. In addition, industrial and agricultural activities release GHGs other than CO_2—notably methane, NO_x, ozone, and chlorofluorocarbons—to the atmosphere, where they can remain for long periods of time.

Kemper County IGCC Project Emissions of GHGs—The Kemper County IGCC Project, operating at an 85-percent capacity factor (i.e., at full capacity), would emit approximately 1.8 to 2.6 million tpy of CO_2 while burning lignite coal and firing natural gas in the duct burners, assuming CO_2 capture of 67 and 50 percent, respectively (see Table 2.5-1). It would also emit small amounts (approximately 91,000 tpy of CO_2 equivalents) of other GHGs (e.g., nitrous oxide from the CTs)[1].

Based on a study of life cycle GHG emissions from IGCC power systems (Reuther *et al.*, 2004), DOE estimates that plant operations support, maintenance, and lignite mining could increase annual GHG emissions at-

[1] These other GHGs would be released by combustion of syngas to generate electricity; combustion of fuels (diesel and gasoline) for transportation and coal mining activities; and the combustion of fuels to produce energy needed for operations and maintenance.

tributable to the operation of the generating station by approximately 130,000 tons (for a total of approximately 2.0 to 2.8 million tons annually). Total emissions of GHGs from construction activities would be approximately 430,000 tons of CO_2 equivalents (approximately 15 to 22 percent of 1 year's operating emissions).

GHG emissions from the coal-mining operations would primarily result from the combustion of diesel fuel in mining equipment and off-road vehicles. The mining equipment would include loaders, large dump trucks, dozers, backhoes, graders, and hydraulic shovels. Emissions were conservatively estimated based on a 7-day-per-week, 24-hour-per-day operating schedule, and a best guess as to the number of pieces of equipment and the percent of time that they would be used. For comparative purposes, the annual emissions of CO_2 from mining operations were estimated at approximately 45,000 tons. These emissions would represent less than 2 percent of the annual Kemper County IGCC Project emissions.

Annual emissions of GHGs from construction activities were estimated to be approximately 27,000 tons of CO_2 (i.e., approximately 1 percent of 1 year's operating emissions of the IGCC facility).

Operating at full capacity with beneficial use of CO_2 for EOR and geologic storage, the facility would constitute one of the larger point sources of CO_2 emissions in Mississippi. Neither federal law nor Mississippi law place limits on CO_2 emissions on sources such as the Kemper County IGCC Project, and generally there are few economic incentives or regulatory requirements for utilities to reduce emissions of GHGs from their power plants at this time. However, the federal government is considering several approaches to addressing global warming by limiting emissions of GHGs, including regulating them under the CAA.

The GHGs emitted by the Kemper County IGCC Project would add a relatively small increment to emissions of these gases in the United States and the world. Overall GHG emissions in the United States during 2007 totaled approximately 7,881.6 million tons (7,150.1 million metric tonnes) of CO_2-equivalents, including approximately 6,727.8 million tons (6,103.4 million metric tonnes) of CO_2. These emissions resulted primarily from fossil fuel combustion and industrial processes. Approximately 42 percent of CO_2 emissions came from the generation of electrical power (EPA, 2009). By way of comparison, annual operational emissions of GHGs from the proposed generating station would equal approximately 0.04 percent of the United States' total 2007 emissions.

The release of anthropogenic GHGs and their potential contribution to global warming are inherently cumulative phenomena. That is, emissions of GHGs from the proposed power plant by themselves would not have a direct impact on the global, regional, or local environment. Similarly, current scientific methods do not allow one to correlate emissions from a specific source with a particular change in either local or global climates.

Impacts of GHGs on Climate—Climate is usually defined as the average weather of a region, or more rigorously as the statistical description of a region's weather in terms of the means and variability of relevant parameters over time periods ranging from months to thousands of years. The relevant parameters include temperature, precipitation, wind, and dates of meteorological events such as first and last frosts, beginning and end of rainy seasons, and appearance and disappearance of pack ice. Because GHGs in the atmosphere absorb energy that would otherwise radiate into space, the possibility that anthropogenic releases of these gases could result in warming that might eventually alter climate was recognized soon after the data from Mauna Loa and elsewhere confirmed that the atmosphere's content of CO_2 was steadily increasing (IPCC, 2007a).

Changes in climate are difficult to detect because of the natural and complex variability in meteorological patterns over long periods of time and across broad geographical regions[2]. There is much uncertainty regarding the extent of global warming caused by anthropogenic GHGs, the climate changes this warming has or will produce, and the appropriate strategies for stabilizing the concentrations of GHGs in the atmosphere. The World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP) established IPCC to provide an objective source of information about global warming and climate change, and IPCC's reports are generally considered to be an authoritative source of information on these issues.

According to the IPCC fourth assessment report, "[w]arming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level" (IPCC, 2007b). The IPCC report finds that the global average surface temperature has increased by approximately 0.74°C in the last 100 years; global average sea level has risen approximately 150 millimeters over the same period; and cold days, cold nights, and frosts over most land areas have become less frequent during the past 50 years. The report concludes that most of the temperature increase since the middle of the twentieth century "is very likely due to the observed increase in anthropogenic [GHG] concentrations."

The 2007 report estimates that, at present, CO_2 accounts for approximately 77 percent of the global warming potential attributable to anthropogenic releases of GHGs, with the vast majority (74 percent) of this CO_2 coming from the combustion of fossil fuels. Although the report considers a wide range of future scenarios regarding GHG emissions, CO_2 would continue to contribute more than 70 percent of the total warming potential under all of the scenarios. IPCC therefore believes that further warming is inevitable, but that this warming and its effects on climate could be mitigated by stabilizing the atmosphere's concentration of CO_2 through the use of: (1) "low-carbon technologies" for power production and industrial processes, (2) more efficient use of energy, and (3) management of terrestrial ecosystems to capture atmospheric CO_2 (IPCC, 2007b).

Environmental Impacts of Climate Change—IPCC and the U.S. Climate Change Science Program (CCSP) have examined the potential environmental impacts of climate change at global, national, and regional scales. The IPCC report states that, in addition to increases in global surface temperatures, the impacts of climate change on the global environment may include:

- More frequent heat waves, droughts, and fires.
- Rising sea levels and coastal flooding; melting glaciers, ice caps, and polar ice sheets.
- More severe hurricane activity and increases in frequency and intensity of severe precipitation.
- Spread of infectious diseases to new regions.
- Loss of wildlife habitats.
- Heart and respiratory ailments from higher concentrations of ground-level ozone (IPCC, 2007b).

On a national scale, average surface temperatures in the United States have increased, with the last decade being the warmest in more than a century of direct observations (CCSP, 2008). Impacts on the environment attributed to climate change that have been observed in North America include:

[2] Detection of these types of changes was also difficult because of the limited tools that were available for collecting data and for modeling climate systems. However, scientific advances over the last 20 years have vastly improved the tools available for climatological research.

- Extended periods of high fire risk and large increases in burned area.
- Increased intensity, duration, and frequency of heat waves.
- Decreased snow pack, increased winter and early spring flooding potentials, and reduced summer stream flows in the western mountains.
- Increased stress on biological communities and habitat in coastal areas (IPCC, 2007b).

On a regional scale, there is greater natural variability in climate parameters that makes it difficult to attribute particular environmental impacts to climate change (IPCC, 2007b). However, based on observational evidence, there is likely to be an increasing degree of impacts such as coral reef bleaching, loss of specific wildlife habitats, reductions in the area of certain ecosystems, and smaller yields of major cereal crops in the tropics (*ibid.*). For the northern hemisphere, regional climate change could affect physical and biological systems, agriculture, forests, and amounts of allergenic pollens (*ibid.*)[3].

In the region where the Kemper County IGCC Project would be located, the average temperature over the last century has decreased slightly at a rate of 0.5 to 1°F per century (1901 to 2006), and precipitation in some areas of Mississippi has increased at a rate of 0 to 7 percent per century (EPA, 2008). During the next century, Mississippi's climate may change even more—IPCC predicts that the largest increases in future temperatures are likely to occur in the northern latitudes (IPCC, 2007b).

Addressing Climate Change—Because climate change is a cumulative phenomenon produced by releases of GHGs from industry, agriculture, and land use changes around the world, it is generally accepted that any successful strategy to address it must rest on a global approach to controlling these emissions. In other words, imposing controls on one industry or in one country is unlikely to be an effective strategy. And because GHGs remain in the atmosphere for a long time and industrial societies will continue to use fossil fuels for at least 25 to 50 years, climate change cannot be avoided. As IPCC report states, "[s]ocieties can respond to climate change by adapting to its impacts and by reducing [GHG] emissions (mitigation), thereby reducing the rate and magnitude of change" (IPCC, 2007b).

According to the IPCC, there is a wide array of adaptation options. While adaptation will be an important aspect of reducing societies' vulnerability to the impacts of climate change over the next two to three decades, "adaptation alone is not expected to cope with all the projected effects of climate change, especially not over the long term as most impacts increase in magnitude" (IPCC, 2007). Therefore, it will also be necessary to mitigate climate change by stabilizing the concentrations of GHGs in the atmosphere. Because these gases remain in the atmosphere for long periods of time, stabilizing their atmospheric concentrations will require societies to reduce their annual emissions. The stabilization concentration of a particular GHG is determined by the date that annual emissions of the gas start to decrease, the rate of decrease, and the persistence of the gas in the atmosphere. The IPCC report predicts the magnitude of climate change impacts for a range of scenarios based on different stabilization levels of GHGs. "Responding to climate change involves an iterative risk management process that includes both mitigation and adaptation, taking into account actual and avoided climate change damages, co-benefits, sustainability, equity, and attitudes to risk" (IPCC, 2007b).

[3] The IPCC report provides more detailed information on the current and potential environmental impacts of climate change and on how climate may change in the future under various scenarios of GHG emissions.

Climate Change, GHGs, and the Kemper County IGCC Project—DOE estimates that annual emissions of GHGs from the Kemper County IGCC Project would range from approximately 2.0 to 2.8 million tpy of CO_2-equivalents. Over the 40-year commercial life of the project, total emissions would be up to approximately 80 to 112 million tons. The estimates of emissions from the Kemper County IGCC Project account for CO_2 removal that would occur as a result of the carbon capture and sequestration systems. As mentioned earlier, the plant would be designed to capture and sequester approximately 50 to 67 percent of the CO_2 created in the syngas production process. The annual emissions of GHGs from the Kemper County IGCC Project would add to the approximately 2.64 billion tons (2.40 billion metric tonnes) of energy-related CO_2 emissions released annually by the electric power sector in the United States (EPA, 2009). Coal-fired power plants account for 2.17 billion tons (1.97 billion metric tonnes) of that amount (EPA, 2009). Globally, 54 billion tons (49 billion metric tonnes) of CO_2-equivalent anthropogenic GHGs are emitted annually, with fossil fuel combustion contributing approximately 32 billion tons (29 billion metric tonnes). However, it cannot be assumed that, if the Kemper County IGCC Project were not built, these additional emissions would be avoided—other less efficient and/or more CO_2-emitting fossil fuel power plants might be constructed in its stead, or existing plants might produce more power, thereby increasing their CO_2 emissions.

As noted earlier, emissions of GHGs from the proposed power plant by themselves would not have a direct impact on the environment in the proposed plant's vicinity; neither would these emissions by themselves cause appreciable global warming that would lead to climate changes. However, these emissions would increase the atmosphere's concentration of GHGs, and, in combination with past and future emissions from all other sources, contribute incrementally to the global warming that produces the adverse effects of climate change described previously. At present there is no methodology that would allow DOE to estimate the specific impacts (if any) this increment of warming would produce in the vicinity of the plant or elsewhere.

Climate Change, Greenhouse Gases, and the CCPI— As described in more detail in Subsection 1.2, CCPI provides funding to the private sector for projects intended to demonstrate the commercial potential of advanced technologies that could improve the performance of coal-fired power plants as to energy efficiency, pollution control, and cost of operation.

Increased efficiencies can result in small but cumulatively significant reductions in CO_2 emissions from power stations because less fuel is burned in producing each kilowatt-hour of electricity. Producing power with IGCC units can facilitate carbon capture because the volume of the gas stream from which the CO_2 would be removed is much smaller; it is a precombustion stream and at a higher pressure than the exhaust gas of a pulverized coal unit.

Demonstrations of technologies that increase efficiency, facilitate carbon capture, and sequester CO_2 are important steps in developing strategies for stabilizing atmospheric concentrations of GHGs. The IPCC report states that there is high agreement that atmospheric concentrations can be stabilized by "deployment of a portfolio of technologies that are either currently available or expected to be commercialized in coming decades assuming that appropriate and effective incentives are in place for their development." It identifies carbon capture and storage for coal-fired power plants as one of the key mitigation technologies for development before 2030 (IPCC, 2007b). It notes that energy efficiency will also play a key role in stabilizing atmospheric concentrations. DOE believes that the objectives of CCPI embody these recommendations of the IPCC, and that by providing funding to the Kemper County IGCC Project and other CCPI projects, DOE is providing appropriate incentives for developing technologies that can address global warming and the adverse environmental impacts of climate change.

6.2 SURFACE WATER RESOURCES

Surface water resources could be affected by two separate actions under consideration by DOE: (1) the Kemper County IGCC Project evaluated in this EIS, and (2) construction and operation of a strategic petroleum reserve (SPR) facility downstream at Richton in Perry County, Mississippi. Figure 6.2-1 illustrates the locations of these two projects. In addition, USACE's Civil Works program actions could affect surface water resources in two ways: regulatory approvals of 404 Permit applications and reasonably foreseeable navigation, hydraulics, and habitat projects.

The areal extent of these cumulative effects would be the Pascagoula River basin, including the saltwater/freshwater interface in the estuary at the river's mouth. Current conditions in the river reflect past and present actions. The analysis that follows focuses on future reasonably foreseeable actions by DOE and USACE.

6.2.1 DOE ACTIONS

The Energy Policy Act of 2005 (EPACT) (P.L. 109-58) required DOE to expand the SPR from its current 727-million-barrel capacity to 1 billion barrels. To fulfill its NEPA requirements, DOE prepared an EIS regarding site selection. The preferred alternative that evolved from the EIS site section process was the location of a new SPR facility near Richton, Mississippi, due to the presence of a large, undeveloped salt dome, enhanced oil distribution capabilities, and an inland location less vulnerable to hurricanes.

The principal effects on water resources attributable to the SPR expansion would be: (1) the need to withdraw up to 50 MGD (i.e., approximately 77 cfs) continuously during the construction period and during petroleum withdrawals (i.e., to replace the volume of petroleum withdrawn with water to maintain the integrity of the dome); and (2) the need to discharge brine generated by dissolution of the salt to form the petroleum storage cavity, as well as when brine is pumped out of the cavity to make room for petroleum additions. The volume of brine discharge would correspond to the volume of raw water makeup.

DOE is considering locating the raw water intake immediately downstream of the confluence of the Leaf and Chickasawhay Rivers in the Pascagoula River near the USGS Merrill gauging station. The brine discharge would occur offshore in the Gulf of Mexico. The Kemper County IGCC Project site is inland and located in a different watershed than the proposed SPR brine discharge facility. Therefore, no cumulative effects would be associated with the contemplated brine discharges.

DOE is conducting two modeling efforts to predict the effects of the water withdrawals required by the SPR Richton site on the Pascagoula River: (1) a Pascagoula River Habitat Study: IFIM (available at http://fossil.energy.gov/programs/reserves/spr/expansion_reports_and_studies.html); and (2) a Pascagoula River Salt Water Wedge Study (estimated availability later in 2009). The habitat study resulted in DOE proposing the following limits to withdrawals to maintain the minimum instream flow necessary to support the federally protected species in the river. The proposed withdrawal limits would be:

- No withdrawals would occur during flows of less than 1,000 cfs.
- Withdrawals of up to 39 cfs would occur at flows of 1,000 to 1,100 cfs (3.5 to 3.9 percent of flow).

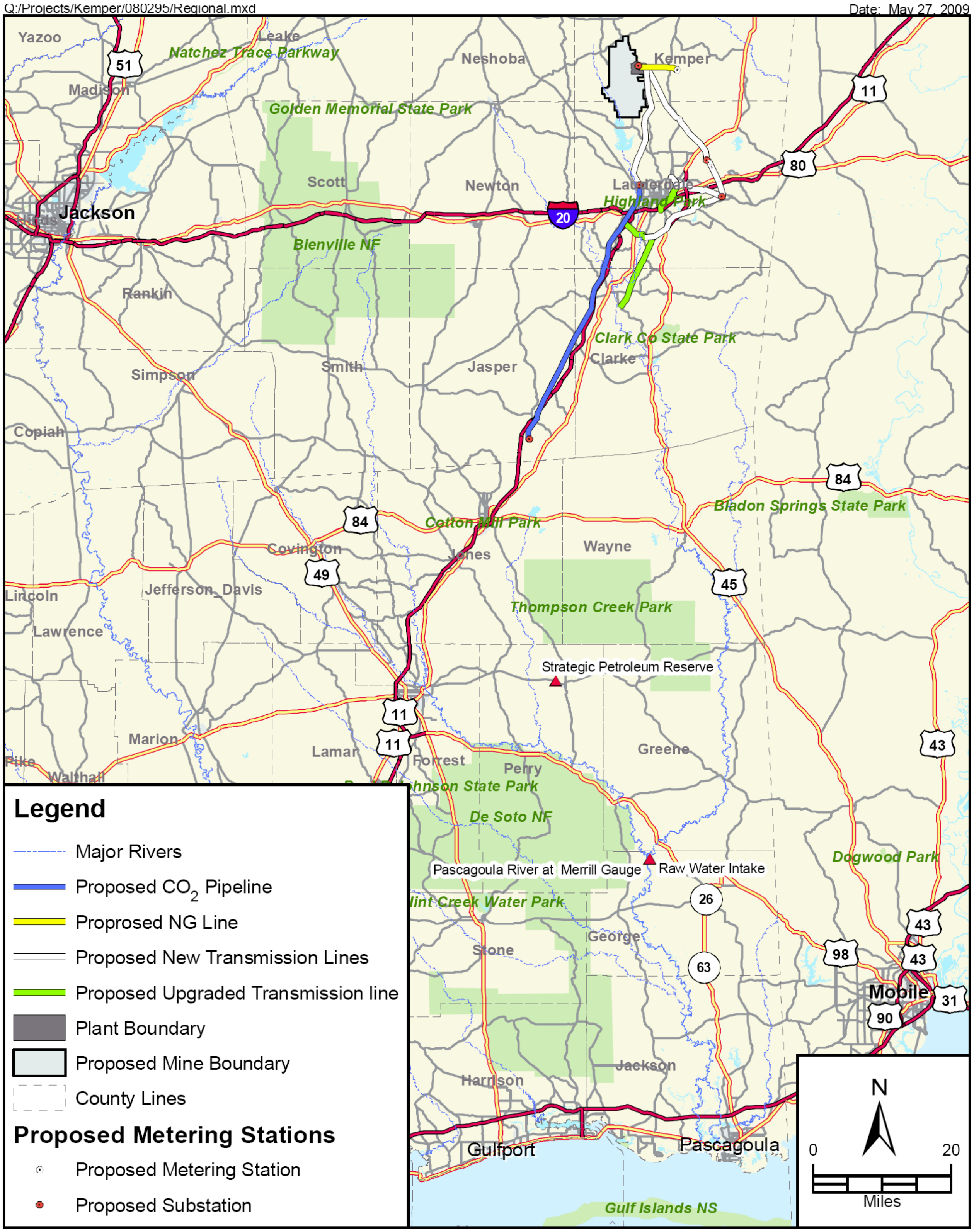

Figure 6.2-1. DOE Actions in Eastern Mississippi
Source: ECT, 2009.

- Withdrawals of up to 78 cfs would occur at flows of more than 1,100 cfs (up to 7.1 percent of flow).

Because yearly low flows predictably occur in October, DOE would also schedule system maintenance to occur at that time, thereby reducing the need to operate the diversion during annual low flows (DOE, 2009).

Across the 78-year period of record for the USGS flow gauge at Merrill, the average daily flow is 1,120 cfs. The drainage area at the Merrill gauge is 6,590 mi^2; the 31,000-acre Kemper County IGCC Project study area represents 0.74 percent of the Merrill gauge drainage area. MDEQ has set the 7Q10 flow at the Merrill gauge at 917 cfs. These flow measurements include historic releases from Okatibbee Lake according to the schedule shown in Table 6.2-1. The proposed DOE SPR withdrawal schedule does not require or request USACE to adjust the Okatibbee Lake release schedule to augment low-flow conditions to facilitate development of the SPR.

Table 6.2-1. Okatibbee Dam Minimum Discharges

Month	Minimum Discharge (cfs)
January	10
February	10
March	10
April	50
May	50
June	70/50/30*
July	70/50/30*
August	70/50/30*
September	30
October	30
November	10
December	10

*Pulse and minimum releases subject to lake level.

The hydrologic analyses conducted in this Kemper County IGCC Project EIS are presented in Subsection 4.2.4. Those analyses included incremental water budget analyses and modeling of responses to various storm event responses. The storm event models predicted changes in high-flow conditions, which are not at issue in the SPR evaluations. The water budget of Okatibbee Lake is as follows:

- Rainfall = 57.04 inches.
- Runoff = 17.00 inches.
- Onsite consumption = 40.04 inches.

Onsite consumption would consist of deep recharge, net ground water outflow, evaporation, and transpiration. Deep recharge is negligible due to the presence of dense clay beneath the mineable lignite seams. Thus, the predominant onsite consumption factors are evaporation and transpiration.

Onsite consumption during mining would decrease, as up to 3 mi^2 of mined land would consist of disturbed, unreclaimed overburden. These areas could increase the average annual flow into Okatibbee Lake by approximately 2 cfs, or 1 percent of the annual average flow across the dam. Such changes would represent less than 0.02 percent of the average flow at the Merrill gauge site.

Onsite consumption in the postreclamation condition would be controlled by the percentage of open water, wetlands, forested uplands, and grasslands in the landscape. Onsite consumption would increase if more acres of open water and wetlands exist when compared to the current condition. However, because the total disturbed areas would represent less than 0.3 percent of the Merrill gauge drainage area where the SPR withdrawals would occur, the cumulative effect of the two DOE projects would be insignificant.

In conclusion, the two DOE actions under consideration would not synergize into cumulative effects. Because SPR withdrawals would be controlled by flow volumes at the Merrill gauge, any changes to low flow volumes attributable to the Kemper County IGCC Project would influence when SPR withdrawals could occur but would not combine into cumulative flow reductions downstream beyond those caused by the SPR withdrawals.

6.2.2 USACE ACTIONS

USACE is subject to the same cumulative impact assessment standards and criteria that apply to DOE. Both USACE's (a) regulatory permit programs under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act and (b) Civil Works program are subject to these requirements. Accordingly, as USACE evaluates permit applications under its regulatory programs or considers civil works projects, the cumulative effects of those proposed activities or projects are evaluated and considered prior to permit issuance or Civil Works project authorization. Under these regulations and procedures, for example, USACE would evaluate the potential cumulative effects of the proposed Kemper County IGCC Project during their review of applications submitted by Mississippi Power and NACC as one element of their decision-making concerning whether to issue the requested permits.

6.3 GEOLOGIC AND GROUND WATER RESOURCES

The direct and indirect geologic impacts of the action alternative, and the resultant construction and operation of the generation facility, surface lignite mine, and associated linear facilities, were described in Subsection 4.2.2. Adoption of the action alternative would not result in significant cumulative impacts to geological resources such as the potential for seismic activity or the future recovery of minerals in the area.

Potential impacts on ground water resources resulting from the construction and operation of the generation facility, surface lignite mine, and associated linear facilities, were described in Subsection 4.2.5. The cumulative impacts would primarily affect ground water availability in the shallow Middle Wilcox aquifer and the deep Massive Sand aquifer. Current uses of these aquifers were described in Subsection 3.7.2, and the estimated water level drawdowns and impacts were described in Subsection 4.2.5.2. The drawdown in the GS sand interval of the Middle Wilcox aquifer could approach 15 ft only to the extent of approximately 0.5 to 1 mile beyond the active mining area, and those drawdowns would not be permanent at any given location. Modeling estimated approximately 6 ft of drawdown at the nearest existing user of the Massive Sand aquifer. This small change in static head in deep wells would result in no measurable change in pump performance or power requirements.

No changes to ground water quality would be expected in any aquifer, with one possible exception. Ground water in the mine spoil deposits in the reclaimed mine areas would likely have higher TDS concentrations than premining ground water, which could preclude development of shallow freshwater wells in the mined portions of the Middle Wilcox aquifer. Fresh ground water would remain available from the underlying Lower Wilcox aquifer, and perhaps from lower sand intervals within the Middle Wilcox aquifer.

6.4 SOCIAL AND ECONOMIC RESOURCES, INCLUDING TRAFFIC CONGESTION ISSUES

Construction and operation of the proposed power plant and the surface lignite mine would be unlikely to combine with any other development activity in the immediate project area to result in cumulative impacts. The area is rural and has not supported significant commercial or industrial development in the past and is not likely to in the foreseeable future. The anticipated economic impact of the direct-effect multiplier would be likely to occur in and around the established municipalities in the area. Similarly, while there would be traffic congestion and a potential for limited housing opportunities, particularly during construction, in the project area, there would likely not be a combined effect with other projects.

There are no known or planned projects in the surrounding area where the local roadways or local housing market would experience traffic/population influx in addition to that generated by the proposed power plant and surface lignite mine construction and operation. The business development manager for the area economic development corporation informed that net employment resulting from known business expansions and contractions would be negative (i.e., net job loss) (Scaggs, 2009). In addition, a recent study of the area's employment (The Pathfinders, 2008) found that: (a) there are "approximately 12,700 unemployed persons actively seeking work," (b) there is "significant underemployment (employment below skill level)," and (c) the "area has approximately 29,400 available workers for new or expanding businesses." Mississippi Power (2009) inquiries also turned up no plans for major project or development activity in the area during the foreseeable future.

Without the proposed project, the population of Kemper County in 2011 is estimated to decrease from that in 2000. Thus, no cumulative effects on demands for labor and socioeconomic resources would be anticipated as a result of the development of the Kemper County IGCC Project.

6.5 ENVIRONMENTAL JUSTICE

Subsection 4.2.12 discussed environmental justice issues. While an environmental justice population exists, "disproportionately high and adverse" impacts to minority and low-income population would not be expected to result, and no additional current or future stressors were identified. Economic direct and indirect multiplier impacts would most likely accrue to the larger municipal areas in the adjacent counties. There might be additional support development occurring in the DeKalb and Scooba areas where there is infrastructure to support such development. The immediate project area is anticipated to remain rural with only limited commercial development likely to occur.

6.6 OTHER ISSUES

The proposed project would have some impacts to other resources, such as noise and ecological resources. The noise impacts of the IGCC power plant and surface lignite mine would not be cumulative, as shown in Subsection 4.2.18.2. In addition, there are no other known or anticipated developments that could add to the noise environment.

Similarly, the project would impact ecological resources, including wetlands. All wetlands impacted by project activities would be subject to permitting and mitigation. There are no other known or anticipated developments that could result in cumulative impacts on wetlands and other ecological resources.

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