4. ENVIRONMENTAL CONSEQUENCES

4.1 PROPOSED ACTION

4.1.1 Land Use and Aesthetics

4.1.1.1 Land Use

The proposed facilities would be confined to the existing Stanton Energy Center site and thus would not directly affect offsite land use. The 1,100-acre developed portion of the power plant site is designated specifically for power generation through the site certification process under Florida's Power Plant Siting Act. Through this process, power production has previously been approved by state and local agencies as an activity compatible with offsite land use, and the power plant has been determined to satisfy zoning requirements.

Land in the surrounding area is either (1) already developed (e.g., Avalon Park, Orange County Sanitary Landfill, Central Florida Reception Center), (2) planned for development that would be compatible with (or not affected by) the proposed facilities (e.g., the proposed International Corporate Park), or (3) prohibited from development (i.e., Hal Scott Regional Preserve and Park). The limited in-migration of workers required for construction and operation of the proposed facilities would not increase offsite land use for residential purposes (Section 4.1.7.3).

The entire Stanton Energy Center site is currently zoned as "Farmland Rural (A-2)" in the Orange County Comprehensive Plan, but the plan designates the developed portions of the site as an "Institutional" land use. The Institutional land use designation allows for any zoning district, according to the Future Land Use Element of the Comprehensive Plan. The Land Development Code contains a table of permitted uses, special exceptions, and prohibited uses. The table lists power plants and, within the A-2 zoning district, power plants are identified as a "special exception" required.

A 1981 resolution by the Orange County Board of County Commissioners granted a special exception permitting the construction of the Stanton Energy Center and associated facilities within the A-2 zoning district. The special exception was applied to the entire 3,280-acre site, including future units such as the proposed IGCC facilities.

Construction and operation of the proposed facilities within the "Institutional" portion of the Stanton Energy Center site would be consistent with the Orange County Comprehensive Plan because the facilities (1) would be similar to and compatible with the surrounding area and consistent with the pattern of development, (2) would not be a detrimental intrusion into the surrounding area, and (3) would meet the performance standards and buffer yard requirements of the Farmland Rural (A-2) zone.

4.1.1.2 Aesthetics

The tallest structures to be constructed as part of the proposed facilities would be the 205-ft HRSG stack, the 174-ft structure to house the gasifier, and the 114-ft HRSG. These structures would be shorter than the existing two 550-ft stacks serving Units 1 and 2, the two 431-ft natural-draft cooling towers serving Units 1 and 2, and the 225-ft Unit 1 and 2 boiler buildings. Aesthetic impacts of the proposed facilities would be further reduced because the facilities would be located between existing facilities, appearing as a continuation of the existing industrial character of the site rather than as a change in character. Although the existing power plant is visible from part of the surrounding local area, the 550-ft stacks and 431-ft cooling towers are the only conspicuous onsite structures that can be seen from nearby homes because of the forested buffer that visually screens most of the facilities (Section 3.1.3). Consequently, the proposed facilities, which would be shorter than the existing 225-ft Unit 1 and 2 boiler buildings, would likely not be visible from nearby homes.

The only federal, state, or local scenic, cultural, or natural landmark in the vicinity of the Stanton Energy Center site is the adjacent Hal Scott Regional Preserve and Park to the east of the site. Minimal aesthetic impacts upon this resource would be experienced due to the 1-mile separation of the park from the proposed facilities, the presence of the existing power plant facilities, and the adequacy of forested land to screen much of the plant site.

Because operation of the proposed multipoint flare would produce almost no visible flame during daylight hours, the flare would be nearly undetectable, except for shadows from heat effects (Section 2.1.2.8). Blue/purple flames would be visible during the nighttime from nearby locations with lines of sight to the flare. The flame height would rise to about 40 ft above the burners, which would be located 10 ft above ground level. A 20-ft tall thermal barrier would block the view of the burners and the lowest 10 ft of the 40-ft flames (Section 2.1.2.8). The forested buffer would visually screen at least part of the flare from nearby homes.

As with the existing Stanton Energy Center (Section 3.1.3), water droplets from the stack and plumes of water droplets from the cooling towers would occasionally be visible. Under most meteorological conditions, the atmosphere would be unsaturated and would provide enough mixing so that the water vapor from the stack and cooling towers would not condense. However, during meteorological conditions when the atmosphere is nearly saturated, winds are light, and mixing is very low (i.e., during some early morning hours), condensation is possible, which would appear in the form of a stack plume or cooling tower plume and/or fog (Section 4.1.2.2).

The Federal Aviation Administration would regulate the marking and lighting of temporary and permanent structures associated with the proposed facilities (Section 7.1). Generally, construction cranes and other elevated equipment require lighting if their height above the ground exceeds 200 ft. The 205-ft HRSG stack would probably require medium- or high-intensity flashing white obstruction lights. The lights would operate at reduced intensity during the night. Because this type of lighting is currently installed and operating on the Stanton Energy Center's Unit 1 and 2 stacks and cooling towers, the additional lighting would be consistent with the site's industrial appearance.

4.1.2 Atmospheric Resources and Air Quality

This section evaluates potential impacts to atmospheric resources that could result from construction and operation of the proposed facilities. Section 4.1.2.1 discusses effects of construction, including fugitive dust associated with earthwork and excavation. Section 4.1.2.2 discusses operational effects, including from emissions of criteria and hazardous air pollutants, regional-scale acidic deposition, and global climate change.

4.1.2.1 Construction

During construction of the proposed facilities, temporary and localized increases in atmospheric concentrations of NO_x, VOCs, CO, SO_2, and particulate matter would result from exhaust emissions of workers' vehicles, heavy construction vehicles, diesel generators, and other machinery and tools. An average of about 30 vehicles, ranging from passenger vehicles to earthmovers, would be used for construction activities on the site. Internal combustion engines would be used for activities such as excavation, concrete placement, and structural steel installation. Construction vehicles and machinery would be equipped with standard pollution-control devices to minimize emissions. These emissions would be very small compared to regulatory thresholds typically used to determine whether further air quality impact analysis is necessary [such as 40 CFR Part 93.153(b)].

During construction a variety of equipment including cranes, earth-moving equipment, and other internal combustion engine equipment would be operated for periods of up to 30 months. For actual construction, hours of operation, emission controls, vehicle maintenance, and forms of fuel are unknown. For purposes of estimating potential impact, emissions from another small construction activity were considered. The construction of a compressor station (Dover) in Air Quality Control Region 161 summarized total construction emissions for NOx, PM 2.5, SO2, and VOCs as 0.59, 0.04, 0.09, and 0.05 tons per year respectively. If these construction emissions are assumed to be representative of the proposed construction activities at the Stanton Energy Center, they would make up less than 0.002 percent of the anticipated plant emissions from normal plant operations.

Air toxic emissions from construction activities would be associated primarily with VOC emissions from diesel equipment. EPA has estimated the fraction of air toxics in VOCs from diesel exhaust as follows: benzene, 0.02; formaldehyde, 0.118; acetaldehyde, 0.053; 1,3-butadiene, 0.002; and acrolein, 0.003. Using these fractions and the VOC emission estimate of 0.05 tons per year, the annual emissions of air toxics in pounds per year would be as follows: benzene, 2; formaldehyde, 12; acetaldehyde, 5.3; 1,3-butadiene, 0.2; and acrolein, 0.3. These values are about 1% or less than the annual emissions expected from normal plant operations. Given the distances to the nearest property boundary (3000 feet) and the nearest residence (6500 feet), these emissions are not expected to result in ambient concentrations of air toxics that would exceed any reference concentration associated with acute or chronic effects.

Fugitive dust would result from excavation, soil storage, and earthwork. Most of this work would occur at the 35-acre principal site of the proposed facilities located between the existing coal-fired units and the existing natural gas-fired combined-cycle unit. Minor clearing and grading activities would occur along the short transmission line (approximately 3,200 ft in length) proposed to serve as an electrical interconnection from the proposed facilities to the existing onsite substation.

The impacts of fugitive dust on particulate concentrations in the ambient air were modeled using the EPA-approved SCREEN3 air dispersion model, which is a single-source, steady-state Gaussian plume model that predicts maximum ground-level concentrations downwind from point, area, flare, and volume sources (EPA 1995a). SCREEN3, a screening version of the Industrial Source Complex Short-Term (ISCST3) model (EPA 1995b), provides conservative results (forming an upper bound) using a full range of 54 potential meteorological conditions (i.e., conditions representing different combinations of atmospheric stabilities and wind speeds). This screening meteorological data set typically results in appreciably greater modeled concentrations compared to modeled concentrations using actual meteorological data. The SCREEN3 model was run using flat terrain, which is conservative for a nonbuoyant ground-level source such as fugitive dust generated during earthwork. Conversion factors were used to adjust the maximum 1-hour concentrations predicted by SCREEN3 to 24-hour and annual averages (EPA 1992), as required for comparison with particulate standards (Table 3.2.1).

The temporary impacts of fugitive dust from construction activities on offsite particulate concentrations would be localized because of the relatively rapid settling of larger-size fugitive dust particles. An average emission factor of 1.2 tons of total suspended particulate matter per acre per month was assumed (EPA 1985a). Of these emissions, roughly 30% of the mass would consist of particulate matter less than 10 μm in aerodynamic diameter (PM-10) (Kinsey and Cowherd 1992). To minimize fugitive dust emissions, water spray trucks would dampen exposed soil at the construction site with water as necessary, which was assumed would reduce fugitive dust by 50% (EPA 1985a). Because the Stanton Energy Center has an existing network of paved access roads, no watering would be required on these roads. Because construction on the 35-acre plot of land would be staggered, the maximum area undergoing heavy earthwork at any one time was assumed to be 10 acres.

For the proposed construction activities, modeling results indicated that the greatest PM-10 concentrations would occur at the proposed construction site, and concentrations would decrease steadily with distance from the site. Consequently, the maximum concentrations in the ambient air would occur at the nearest property boundary, located approximately 3,000 ft to the north of the northern edge of the proposed principal site. The maximum modeled 24-hour PM-10 concentration at this location (adjusted by the conversion factor) was predicted to be 89 $\mu g/m^3$, and the maximum modeled annual PM-10 concentration (adjusted by the conversion factor) was predicted to be 18 $\mu g/m^3$. For comparison with the NAAQS, total PM-10 concentrations were obtained by adding maximum modeled concentrations to their corresponding background concentrations. To parallel the methodology of the standards, the background concentrations used (i.e., 41 $\mu g/m^3$ for the 24-hour averaging period and 27 $\mu g/m^3$ for the annual average) were the 5th highest 24-hour concentration and the maximum annual concentration recorded during the 4-year period at the Sheriff's Department, which recorded the highest concentrations of nearby PM-10 monitoring stations in Orlando (Table 3.2.1). For the 24-hour averaging period, the total PM-10 concentration was predicted to be 130 $\mu g/m^3$ [89 (modeled) + 41 (background) = 130 (total)], which is less than its corresponding NAAQS of 150 $\mu g/m^3$ (Table 3.2.1). For the annual averaging period, the total PM-10 concentration was predicted to be 45 μg/m^3 [18 (modeled) + 27 (background) = 45 (total)], which is less than its corresponding NAAQS of 50 μg/m^3 (Table 3.2.1).

A similar modeling analysis of proposed construction activities was conducted for the impacts of fugitive dust on offsite concentrations of particulate matter less than 2.5 μm in aerodynamic diameter (PM-2.5). PM-2.5 emissions of fugitive dust were assumed to be 10% of PM-10 emissions (MRI 2005). As with the PM-10 analysis, modeling results indicated that the maximum concentrations in the ambient air would occur at the nearest property boundary, located approximately 3,000 ft to the north of the northern edge of the proposed principal site. The maximum modeled 24-hour PM-2.5 concentration at this location (adjusted by the conversion factor) was predicted to be 9 μg/m^3, and the maximum modeled annual PM-2.5 concentration (adjusted by the conversion factor) was predicted to be 2 μg/m^3. For comparison with the NAAQS, total PM-2.5 concentrations were obtained by adding maximum modeled concentrations to their corresponding background concentrations. To parallel the methodology of the standards, the background 24-hour concentration used was the highest 3-year average of the 2^{nd} highest 24-hour concentrations (34 μg/m^3), and the background annual concentration used was the maximum annual average (12 μg/m^3). Both background concentrations were obtained from the 5-year record at North Primrose Avenue, which recorded the highest concentrations of nearby PM-2.5 monitoring stations in Orlando (Table 3.2.1). For the 24-hour averaging period, the total PM-2.5 concentration was predicted to be 43 μg/m^3 [9 (modeled) + 34 (background) = 43 (total)], which is less than its corresponding NAAQS of 65 μg/m^3 (Table 3.2.1). For the annual averaging period, the total PM-2.5 concentration was predicted to be 14 μg/m^3 [2 (modeled) + 12 (background) = 14 (total)], which is less than its corresponding NAAQS of 15 μg/m^3 (Table 3.2.1).

Actual concentrations would be less than predicted because of the conservative assumptions, including linking worst-case meteorological conditions (occurring during the nighttime) with the emission factors described above. Actual emissions during these nighttime meteorological conditions would be considerably less because no machinery would be operating and because of the low wind speed (about 2 miles per hour) associated with worst-case meteorological conditions, which would minimize exposed soil from becoming airborne.

4.1.2.2 Operation

Sources of air emissions from the proposed facilities would include the HRSG stack, startup stack, multipoint flare, and 6-cell mechanical-draft cooling tower, of which the HRSG stack would generate the most emissions. Except during occasional startups, shutdowns, and upsets, the flare would normally have only minimal emissions associated with eight natural gas-fired pilot lights. To ensure a conservative estimate, emissions for air quality modeling purposes, are based on 100% load throughout the year (100% capacity factor) using the higher of estimated synthesis gas or natural gas emission rates. On this basis, annual emissions of criteria pollutants from the proposed facilities would include 162 tons of SO_2, 1,006 tons of NO_x, 189 tons of particulate matter, 654 tons of carbon monoxide (CO), and 0.03 tons of lead (Pb). Annual NO_x emissions from the Stanton Energy Center overall would not be expected to increase because, as part of the air permitting process, OUC has agreed to reduce NO_x emissions from other units at the Stanton Energy Center so that there would be a net decrease in NO_x emissions. Annual emissions of volatile organic compounds (VOCs), a precursor of the criteria pollutant ozone, would be 129 tons.

Mobile emission sources would include plant vehicular traffic and personal commuter vehicles. About 20 vehicles, ranging from passenger vehicles to tanker trucks, would be used during operations on the site. These vehicles would be equipped with standard pollution-control devices to minimize emissions, which would be very small compared to regulatory thresholds typically used to determine whether further air quality impact analysis is necessary [such as 40 CFR Part 93.153(b)]. The small amount of traffic would not contribute appreciably to ambient air pollutant concentrations in the area. Emissions from the two to three trains per week delivering coal from the Powder River Basin in Wyoming to the Stanton Energy Center would be modest compared to regulatory thresholds.

Additional particulate matter would be generated from handling, transfer, and storage of coal, process wastes, and byproducts. To reduce these particulate emissions, the number of handling and transfer points would be minimized, the conveyors and material loading and unloading points would be enclosed, and wetting systems and collection devices (e.g., baghouses) would be installed.

Minor atmospheric impacts would be expected in Wyoming from the slightly increased level of coal mining in the Powder River Basin. The active mining area would likely remain the same, but the rate of mining would increase to accommodate the annual requirement of approximately 1.02 million tons by the proposed facilities. For comparison, Wyoming coal production during 2004 was at a level of about 396 million tons. About 96% of that total was produced in the Powder River Basin. Emissions from mining vehicles and equipment and fugitive particulate emissions would increase slightly from the additional mining. Fugitive dust consists primarily of large particles that would settle quickly and pose minimal adverse public health effects.

Criteria Pollutants

As discussed in detail in Appendix D, potential air quality impacts associated with operation of the proposed facilities were evaluated using a two-tiered approach: screening and refined. At the screening level, modeling provided conservative estimates of impacts to determine whether more detailed modeling was required. Screening modeling was also used to identify worst-case operating scenarios for subsequent refined modeling analysis. For the proposed facilities, the current version of EPA's SCREEN3 Dispersion Model (EPA 1995a) (Version 96043; February 12, 1996) was employed as a screening tool to evaluate the various operating scenarios associated with the proposed facilities.

The refined level of air dispersion modeling consists of techniques that provide more advanced technical treatment of atmospheric processes. Refined modeling requires more detailed and precise input data, but also provides improved estimates of source impacts. The American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD) modeling system (EPA 2004a; EPA 2004b), together with 5 years of hourly meteorological data were used in the refined ambient impact analysis.

AERMOD was used to obtain refined impact predictions for short-term periods (i.e., periods equal to or less than 24 hours) and was also utilized to obtain refined predictions of annual average concentrations. In the analyses, all particulate emissions were conservatively assumed to be less than or equal to 10 µm in aerodynamic diameter (PM-10) for comparison with the standards.

The refined analysis incorporating multiple years of meteorology was conducted to determine air quality impacts for the worst-case operating scenarios identified by the screening analysis. Because no surface or upper-air meteorological stations are located at the Stanton Energy Center (Section 3.2.1), the refined analysis used five years of surface meteorological data from Orlando International Airport (about 8 miles southwest of the power plant) and upper-air data from Ruskin, Florida (about 90 miles southwest of the power plant near the Gulf Coast). Orlando International Airport is the nearest location at which quality-assured hourly meteorological data are archived. Due to the proximity of the airport to the proposed site and due to the terrain in the area being relatively flat and homogeneous, meteorological data from the airport are considered representative of the project site. For meteorological data input to the AERMOD model, the analysis used the most recent consecutive 5 years of airport data (1996–2000) that satisfied the guideline suggested by EPA (2000) of no more than 10% missing data per year. More recent years were excluded because 11.7% of the airport data was missing in the year 2001.

Mixing height data were generated using Orlando International Airport surface data in conjunction with upper-air data for the same 5-year period (1996–2000) from Ruskin, Florida, the nearest upper-air station. The upper-air data represent large-scale meteorological conditions, which usually are relatively uniform between Ruskin and Orlando compared to surface data. On warm and sunny days, however, when inland areas (e.g., Orlando) can be much warmer than coastal areas (e.g., Ruskin), the height above ground to which convection causes appreciable vertical mixing (the mixing height) is typically higher over inland areas and lower over coastal areas. Consequently, in such cases, the lower mixing height generated by using the upper-air data at Ruskin would tend to underestimate the thickness of the atmosphere available for vigorous mixing and overestimate actual downwind concentrations. The Ruskin data, which are the best available, are conservative (i.e., form an upper bound) under most conditions.

Concentrations were modeled at ground-level locations (receptors) along or outside the Stanton Energy Center property boundary. At the site fence line, receptors were placed at 164-ft intervals. At multiple rectangular grids beyond the fence line, receptors were placed at 328-ft intervals within about 2 miles of the power plant, at 820-ft intervals extending to about 4 miles from the plant, and at 1,640-ft intervals out to about 9 miles. Terrain considerations used by the AERMOD model are discussed in Section D.6 of Appendix D. Because of the large existing buildings nearby, wake effects from building downwash were considered using EPA's Building Profile Input Program (BPIP) to determine the area of influence for each building. The results were used as input to the AERMOD model.

In this analysis, significant impact levels were used to measure the significance of the maximum predicted concentrations (EPA 1990). The significant impact levels are much more stringent than the

NAAQS (Table 3.2.1) and PSD Class II increments (Table 3.2.2), and even more stringent or the same as the PSD Class I increments (Table 3.2.2). According to EPA guidelines (1990), a preliminary modeling analysis using significant impact levels should include only the emissions associated with the proposed facilities to determine if the facilities would have a significant impact on ambient air quality. If the maximum predicted concentrations are less than the significant impact levels, additional modeling including other sources and background concentrations is not required for regulatory purposes (EPA 1990).

Results indicate that maximum concentrations are predicted to be less than their corresponding significant impact levels (Table 4.1.1). Therefore, additional modeling including other sources and background concentrations would not be required by EPA for regulatory purposes for any of the pollutants. Because of the conservative assumptions used in the analysis, actual degradation of air quality should be even less than the small amounts predicted. Maximum concentrations for all pollutants and averaging periods were predicted to occur at or near the Stanton Energy Center property boundary at approximately 3,400 ft north of the proposed HRSG stack. Concentrations at other locations, including nearby residences, would be less. Concentrations would be negligible at the nearest PSD Class I area, about 90 miles to the west-northwest (Section 3.2.2), because dispersion of pollutants at that distance would reduce atmospheric concentrations to a small fraction of the maximum modeled concentrations, which are predicted to be less than PSD Class I increments at the location of their maximum impact at or near the Stanton Energy Center property boundary.

Table 4.1.1. Maximum predicted ambient air pollutant concentrations due to emissions from the proposed facilities compared to significant impact levels

Averaging period	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM-10 ($\mu g/m^3$)	CO ($\mu g/m^3$)	Significant impact level ($\mu g/m^3$)
1-hour	--	--	--	13.7	2,000
3-hour	3.1	--	--	--	25
8-hour	--	--	--	10.2	500
24-hour	1.4	--	4.4	--	5
Annual	0.1	0.6	0.4	--	1

Although additional modeling including other sources and background concentrations is not required for regulatory purposes for any of the pollutants, nevertheless the modeling results in Table 4.1.1 (SO_2, NO_2, PM-10, and CO) were added to the ambient background concentrations measured in the Orlando area (Table 3.2.1, which incorporates all existing sources, including those at the Stanton Energy Center). The results are compared with the ambient air quality standards (Table 4.1.2). The total impact (second column from the right in Table 4.1.2) is the sum of the

Table 4.1.2. Ambient air quality standards impact analysis for combined effects of the modeled proposed facilities added to ambient background concentrations measuring existing sources

Pollutant[a]	Averaging period	Standard[b] (μg/m^3)	Modeled concentration[c] (μg/m^3)	Ambient background concentration[d] (μg/m^3)	Total impact[e] (μg/m^3)	Total impact as a percentage of standard
SO_2	3-hour	1,300	3.1	110	113	9
	24-hour	260	1.4	37	38	15
	Annual	60	0.1	8	8	13
NO_2	Annual	100	0.6	23	24	24
PM-10	24-hour	150	4.4	41	45	30
	Annual	50	0.4	27	27	55
PM-2.5	24-hour	65	4.4	34	38	59
	Annual	15	0.4	12	12	83
CO	1-hour	40,000	13.7	9,143	9,157	23
	8-hour	10,000	10.2	5,371	5,381	54

[a]SO_2 = sulfur dioxide; NO_2 = nitrogen dioxide; PM-10 = particulate matter less than 10 Φm in aerodynamic diameter.

[b]National Ambient Air Quality Standards (NAAQS) except for annual and 24-hour averages of SO_2. The NAAQS are established in accordance with the Clean Air Act to protect public health and welfare with an adequate margin of safety. States may establish standards more stringent than NAAQS; Florida has established such standards for annual and 24-hour averages of SO_2.

[c]Maximum modeled concentration from the proposed facilities alone.

[d]From Table 3.2.1.

[e]The sum of the modeled concentration and the ambient background concentration.

modeled concentration (Table 4.1.1) and the ambient background concentration measured in the Orlando area (Table 3.2.1). The highest total impact for SO_2, NO_2, PM-10, and CO is less than 60% of its respective standard (the rightmost column in Table 4.1.2). Consequently, cumulative air quality impacts from the sum of the proposed facilities and existing sources, including those at the Stanton Energy Center even without considering offsets in NO_x emissions, would not be expected.

No significant impact levels or PSD increments currently exist for PM-2.5. However, assuming very conservatively that all particulate emissions from the proposed facilities are less than or equal to 2.5 μm in aerodynamic diameter (PM-2.5), the maximum modeled 24-hour PM-2.5 concentration of 4.4 μg/m^3 (Table 4.1.1) would be only 7% of its corresponding NAAQS of 65 μg/m^3 (Table 3.2.1). Similarly, the maximum modeled annual PM-2.5 concentration of 0.4 μg/m^3 (Table 4.1.1) would be about 3% of its corresponding NAAQS of 15 μg/m^3 (Table 3.2.1). These small percentages would not be expected to result in violations of the PM-2.5 NAAQS, for which Orange County is in attainment

(Section 3.2.2). The highest total impact for the 24-hour PM-2.5 concentration is about 59% of its respective standard (i.e., the sum of the modeled 4.4 $\mu g/m^3$ and the ambient background concentration of 34 $\mu g/m^3$ in Table 3.2.1 equals 38.4 $\mu g/m^3$, which is 59% of 65 $\mu g/m^3$). Similarly, the highest total impact for the annual PM-2.5 concentration is about 83% of its respective standard (i.e., the sum of the modeled 0.4 $\mu g/m^3$ and the highest ambient background concentration of 12 $\mu g/m^3$ in Table 3.2.1 equals 12.4 $\mu g/m^3$, which is 83% of 15 $\mu g/m^3$). Consequently, cumulative PM-2.5 impacts from the sum of the proposed facilities and existing sources, including those at the Stanton Energy Center, would not be expected.

The proposed facilities would annually emit about 0.03 tons of Pb, which is much less than the PSD Significant Emission Rate of 0.6 tons of Pb per year (40 CFR Part 51.166). Pb concentrations in recent years have been well below NAAQS, largely because of the decreased use of leaded gasoline in automobiles. Therefore, Pb emissions from the proposed facilities are not evaluated further.

Ozone (O_3) is not emitted directly from a combustion source but is formed from photochemical reactions involving emitted VOCs and NO_x. Because the reactions involved can take hours to complete, O_3 can form far from the sources of its precursors (the VOCs and NO_x that initiate its formation). Therefore, the contribution of an individual source to O_3 concentrations at any particular location cannot be readily quantified. As discussed earlier in this section, annual NO_x emissions from the Stanton Energy Center overall would not be expected to increase as a result of the proposed facilities. Annual VOC emissions from the proposed facilities would be 129 tons, which would be about 0.3% of the county's VOC emissions inventory of 50,342 tons in 2001.

Based on Table 3.2.1, the largest recorded 3-year average of 4^{th} highest 8-hour O_3 concentrations was 154 $\mu g/m^3$ at the Morris Boulevard monitoring station in Winter Park during the period 2000–02, which is less than the corresponding standard of 157 $\mu g/m^3$. The most recent 3-year average (2002–04) of 4^{th} highest 8-hour O_3 concentrations was 148 $\mu g/m^3$ at Morris Boulevard and 145 $\mu g/m^3$ at the Winegard Road monitoring station in Orlando. Based on these recorded O_3 concentrations, the small percentage increase in VOC emissions would not be likely to degrade O_3 concentrations sufficiently to cause violations in the O_3 NAAQS, but the magnitude of the degradation cannot be quantified.

Conformity Review

DOE has conducted a conformity review to assess whether a conformity determination (40 CFR Part 93, Subpart B) is needed for the proposed project. Orange County is in attainment with NAAQS and state ambient air quality standards for all pollutants (Section 3.2.2). Further, Orange County is not designated by the U.S. EPA as a maintenance area for any pollutant (an area that previously was a nonattainment area, which is striving to maintain attainment and comply with the state implementation plan). Consequently, no conformity determination is needed to demonstrate that activities associated with the proposed project would conform to applicable implementation plans for bringing the area into attainment with the standards (40 CFR Part 93, Subpart B).

Hazardous Air Pollutants

Based on the proposed facilities operating at 100% load throughout the year using the higher of synthesis gas or natural gas emission rates, annual emissions of hazardous air pollutants from the HRSG stack would include 0.01 tons of mercury and 0.001 tons of beryllium (Table 2.1.3). For comparison, the PSD Significant Emission Rate is 0.1 tons of mercury per year; neither the State of Florida nor the U.S. EPA PSD rules currently include a significant emission rate for beryllium. Mercury can cause ulceration, particularly within the digestive system, liver, and kidneys. Mercury may also disrupt endocrine function, which is of particular significance during fetal development and early childhood, when organ development is most rapid. Beryllium is listed as a known carcinogen (cancer-causing substance) by the American Conference of Governmental Industrial Hygienists (1997). It can also have chronic noncancerous effects such as berylliosis (noncancerous growths in the lungs) and acute effects which primarily affect the lungs.

Ambient air quality standards do not exist for mercury and beryllium. Guideline concentrations are typically obtained by adjusting time-weighted (8-hour) averages specified by the American Conference of Governmental Industrial Hygienists (1997) as maximum allowable concentrations for healthy workers, as follows. The first adjustment to the standards for healthy workers is made because they typically spend an average of 40 hours per week at their workplace rather than 168 hours (around the clock); therefore, the maximum allowable concentration for workers is divided by 4.2 (168/40). The resulting concentration is then divided by 10 because the tolerance of an individual during their years as a healthy adult worker would be greater than for their entire lifetime, especially during childhood and old age. The resulting concentration value is divided again by 10 to account for differing sensitivities to environmental exposures experienced by members of the general population, including the infirm. The final result is a guideline maximum ambient air concentration; for concentrations below the guideline value, it is expected that the public would be protected from adverse impacts. Such guideline values (sometimes referred to as "no-threat levels") are commonly used as maximum permissible ambient air concentrations of substances regulated by 29 CFR Part 1910.1000 (Patrick 1994).

Using the same modeling procedure as for criteria pollutants, the maximum ambient 24-hour concentration of mercury from the proposed HRSG stack is predicted to be 1.6×10^{-4} $\mu g/m^3$, which is 0.8% of its corresponding guideline value of 0.02 $\mu g/m^3$. The maximum ambient 24-hour concentration of beryllium from the stack is predicted to be 1.6×10^{-5} $\mu g/m^3$, which is 0.4% of its corresponding guideline value of 0.004 $\mu g/m^3$. These results indicate that mercury and beryllium emissions from the proposed facilities would pose no direct threat to human health in the area.

As another measure of risk, reference concentrations provided by the EPA Integrated Risk Information System (http://www.epa.gov/iris/) were used to evaluate maximum predicted annual concentrations. Reference concentrations are estimates of continuous inhalation exposure to human population (including sensitive subgroups) that are likely to be without an appreciable risk of deleterious effects during a lifetime. The maximum ambient annual concentration of mercury from the stack is predicted to be 7.7×10^{-6} $\mu g/m^3$, which is 0.003% of its reference concentration of

0.3 μg/m^3. The maximum ambient annual concentration of beryllium from the stack is predicted to be 7.6 x 10^{-7} μg/m^3, which is 0.004% of its reference concentration of 0.02 μg/m^3. These results corroborate that mercury and beryllium emissions from the proposed facilities would pose no direct threat to human health in the area.

As a measure of cumulative impacts associated with combining the proposed facilities with existing sources of mercury and beryllium emissions in the area, including the existing sources at the Stanton Energy Center, the maximum ambient annual concentrations for the proposed facilities (7.7 x 10^{-6} μg/m^3 for mercury and 7.6 x 10^{-7} μg/m^3 for beryllium) were compared and combined with EPA's 1999 National-Scale Air Toxics Assessment: 1999 Data Tables (http://www.epa.gov/ttn/atw/nata1999/tables.html) database that provides (1) modeled concentrations of existing sources within about 30 miles of the site and (2) background concentrations based on monitored values for mercury (because outdoor concentrations of mercury and 27 other air toxics should include background components attributable to long-range transport, unidentified emission sources, and natural emission sources). No background concentrations are available in the EPA database for beryllium. Background concentrations are the contributions to outdoor air toxics concentrations resulting from natural sources, persistence in the environment of past years' emissions, and long-range transport from sources beyond the 30-mile radius.

For mercury, the National-Scale Air Toxics Assessment lists the annual-average background concentration in Orange County, Florida, as 0.0015 μg/m^3, whereas modeled countywide annual-average ambient concentrations from major stationary sources such as the existing Stanton Energy Center are listed as 3.9 x 10^{-6} μg/m^3 and from multiple other sources (e.g., dry cleaners, small manufacturers, wildfires) as 7.2 x 10^{-5} μg/m^3, for a total existing countywide annual average of 0.001575 μg/m^3 for mercury. These values in EPA's 1999 National-Scale Air Toxics Assessment are averaged spatially throughout Orange County, whereas the maximum ambient annual-average concentrations predicted for the proposed facilities are the values predicted for the maximum receptor (downwind location in the ambient air). Consequently, the mercury value predicted for the proposed facilities (7.7 x 10^{-6} μg/m^3) is slightly higher than the countywide annual-average concentrations from major sources (3.9 x 10^{-6} μg/m^3). The sum of concentrations for all existing sources (0.001575 μg/m^3) and the proposed facilities (7.7 x 10^{-6} μg/m^3) would be approximately 0.001583 μg/m^3, which is 0.5% of the reference concentration of 0.3 μg/m^3 for mercury. Consequently, this evaluation using EPA's National-Scale Air Toxics Assessment database indicates that the cumulative impact of mercury emissions from the proposed facilities and emissions from existing facilities including the Stanton Energy Center would pose no direct threat to human health in the area.

For beryllium, the National-Scale Air Toxics Assessment lists no annual-average background concentration in Orange County, Florida, or elsewhere throughout the United States; modeled countywide annual-average ambient concentrations from major stationary sources such as the existing Stanton Energy Center are listed as 2.1 x 10^{-7} μg/m^3, from multiple other sources (e.g., dry cleaners, small manufacturers, wildfires) as 8.1 x 10^{-6} μg/m^3, and from non-road mobile sources as 1.0 x

10^{-7} μg/m^3, for a total existing countywide annual average of 8.4 x 10^{-6} μg/m^3 for beryllium. These values in EPA's 1999 National-Scale Air Toxics Assessment are averaged spatially throughout Orange County, whereas the maximum ambient annual-average concentrations predicted for the proposed facilities are the values predicted for the maximum receptor (downwind location in the ambient air). Consequently, the beryllium value predicted for the proposed facilities (7.6 x 10^{-7} μg/m^3) is slightly higher than the countywide annual-average concentrations from major sources (2.1 x 10^{-7} μg/m^3). The sum of concentrations for all existing sources (8.4 x 10^{-6} μg/m^3) and the proposed facilities (7.6 x 10^{-7} μg/m^3) would be approximately 9.2 x 10^{-6} μg/m^3, which is 0.05% of the reference concentration of 0.02 μg/m^3 for beryllium. Consequently, this evaluation using EPA's National-Scale Air Toxics Assessment database indicates that the cumulative impact of beryllium emissions from the proposed facilities and emissions from existing facilities including the Stanton Energy Center would pose no direct threat to human health in the area.

With regard to deposition, much uncertainty exists regarding the spatial distribution of mercury deposition downwind of emissions sources. Likewise, source identification and attribution based on measurements of mercury deposition (i.e., working in the reverse direction to identify sources of measured deposition) have proven difficult. Moreover, not all emissions are produced by human activity, and lack of reliable data about the speciation of mercury in source emissions further contributes to assessment difficulties (Hanisch 1998). Controversy exists regarding the magnitude of the local impact from sources such as power plants. Global and regional models suggest that about 50% of manmade mercury emissions are transported globally, while the remaining 50% deposit on a local or regional scale (EPRI 1994; Bullock, Brehme, and Mapp 1998). Another study has indicated that mercury is more of a global or regional problem than one of local concern because computer modeling has shown that most mercury emissions from power plants are transported over 60 miles away (Constantinou, Wu, and Seigneur 1995). Sullivan et al. (2005) estimated that less than 2% of total mercury emissions are deposited within 9 miles of their source, based on soil and vegetation samples obtained from around three U.S. coal-fired power plants.

However, some field measurements of oxidized, inorganic mercury appear to contradict these findings. This species normally represents only about 3% of total gaseous mercury, but is expected to account for a major portion of mercury dry deposition. On the basis of measurements near the ground in close vicinity to power plants, a study concluded that cutting a local emissions source of oxidized, inorganic mercury could result in some local reduction of deposition (Lindberg and Stratton 1998). Similar uncertainty exists for deposition of other heavy metals. ***In addition, a recent study sponsored by EPA indicated that mercury deposition from local coal burning power plants can be the dominant source of mercury deposition in some cases (Keeler et al. 2006).***

An assessment of mercury deposition rates that may result from potential emissions from the proposed HRSG stack was conducted. The analysis focused on local deposition (i.e., within about 30 miles) and, because reactive gaseous divalent mercury (Hg^{2+}) (RGM) is the form of mercury emissions (as opposed to elemental or particulate mercury) to dominate deposition at that scale, the analysis estimated the total deposition caused by potential RGM emissions from the proposed facilities. Dry, wet, and total RGM deposition were estimated using the wet and dry algorithms contained in the current version of EPA's AERMOD dispersion model (Version 04300) (EPA 2004a; EPA 2004b) with RGM-specific parameterizations drawn from EPA and literature references.

In the absence of any specific regulatory guidance for performing this type of analysis and in order to provide context for the predicted values, they were compared to available observed data. Since no observations exist for total mercury deposition or its dry deposition component, the modeled wet RGM deposition was compared to observed wet mercury deposition measured at a Mercury Deposition Network monitor located near Orlando and the estimated RGM concentrations were compared to observed ambient air RGM concentrations measured in or near the Everglades.

The combustion of fossil fuels containing mercury may result in emissions of elemental mercury, RGM, and/or particle-bound mercury (Hg_p). Hg_p is emitted in particulate form, while both elemental mercury and RGM are released in the gaseous state. The deposition characteristics of each of these three mercury species differ. Elemental mercury has a long residence time in the atmosphere and travels long distances (i.e., greater than 30 miles) before it is ultimately deposited on the Earth's surface. The other two forms of mercury, RGM and Hg_p, deposit locally (i.e., within about 30 miles) and regionally (i.e., from 30 to several thousand miles). The dispersion of elemental mercury is evaluated on regional and global scales and, therefore, was not considered for this analysis of local mercury deposition.

The proposed IGCC synthesis gas treatment process would include a sulfur-impregnated carbon adsorption system for mercury removal. Due to the nature of the IGCC process, emissions of Hg_p would be low. Combustion of the treated synthesis gas is estimated to result in a potential IGCC total mercury emission rate of 19 lb per year. Of this total, 90% (i.e., 17.1 lb per year) is estimated to be emitted as elemental mercury, 10% (i.e., 1.9 lb/yr) as RGM, and only trace amounts as Hg_p (EPRI 2003). The proposed IGCC HRSG stack parameters and RGM emission rate are summarized in Table 4.1.3 as input to the AERMOD model.

The application of AERMOD for a deposition analysis requires additional parameters associated with the surrounding surface characteristics, transport characteristics of the pollutant, and meteorological data. The selection of each of these model input parameters is discussed below.

Dry gas deposition measures the mass of pollutant transferred to the ground in the absence of precipitation. Because vegetation removes RGM from the atmosphere, information concerning the surface characteristics surrounding the Stanton site was required. The Stanton site vicinity surface characteristics were identified by land use type and seasons of the year. The land use types were determined by dividing a circular area within about 2 miles of the Stanton Energy Center site into 10° segments. A land use category was then assigned to each 10° segment based on the predefined land use categories described in the addendum to the AERMOD User's Guide (EPA 2004a). Table 4.1.4 shows the land use categories selected for the proposed IGCC RGM dry deposition analysis. In addition, the reactivity factor of RGM is required. An RGM reactivity factor of 1.0 was used in accordance with EPA guidance (EPA 2004a).

Table 4.1.3. Location, stack parameters, and emission rate used as input for AERMOD mercury deposition analysis

Location, parameters, and emission rate	IGCC HRSG stack
Stack Location	
UTM East (m)	483,620
UTM North (m)	3,150,953
Stack Parameters	
Exhaust gas temperature (°F)	185.6
Stack diameter (ft)	18.5
Exit velocity (ft/s)	66
Stack height (ft above ground)	205
Emission Rate	
RGM (g/s)	2.73E-05

Source: Orlando Utilities Commission (OUC) 2006.

To determine the amount of vegetative cover surrounding the Stanton site, seasonal data were developed. Seasons were identified for each month of the year, appropriate for the central Florida climate. Using the available AERMOD predefined seasonal categories, seasons associated with a subtropical climate were selected. The seasons selected for the analysis were 5 months as midsummer (May through September), 3 months as autumn (October through December), 2 months as late autumn (January and February), and 2 months as transitional spring (March and April).

The transport and mobility of a pollutant are determined by the physical properties of the specific pollutant. For deposition modeling, AERMOD requires the following pollutant-specific parameters: (1) diffusivity in air; (2) diffusivity in water; (3) leaf cuticular resistance to lipid uptake; and (4) the Henry's Law constant. The values of these parameters selected to represent RGM are shown in Table 4.1.5.

For the IGCC RGM deposition analysis, the general modeling procedures and options specified in the current versions of the AERMOD User's Guide (EPA 2004b) and the Guideline on Air Quality Models (GAQM) were followed. Modeling was conducted in a manner consistent with EPA guidance and standard practices, including the use of regulatory default options, as appropriate. The following paragraphs provide a brief discussion of the selected AERMOD options concerning building downwash, terrain elevations, receptor grids, and meteorological data.

The building downwash analysis was performed using the most recent version of EPA's Building Profile Input Program (BPIP) (Version 04274) with the plume rise model enhancements (PRIME) building downwash algorithms.

Table 4.1.4. Land use categories selected for AERMOD modeling

Wind sector	Land use category
5° to 15°	6 – Suburban areas, forested
15° to 25°	6 – Suburban areas, forested
25° to 35°	6 – Suburban areas, forested
35° to 45°	4 – Forest
45° to 55°	3 – Rangeland
55° to 65°	4 – Forest
65° to 75°	3 – Rangeland
75° to 85°	4 – Forest
85° to 95°	3 – Rangeland
95° to 105°	4 – Forest
105° to 115°	3 – Rangeland
115° to 125°	4 – Forest
125° to 135°	3 – Rangeland
135° to 145°	6 – Suburban areas, forested
145° to 155°	6 – Suburban areas, forested
155° to 165°	6 – Suburban areas, forested
165° to 175°	4 – Forest
175° to 185°	3 – Rangeland
185° to 195°	4 – Forest
195° to 205°	3 – Rangeland
205° to 215°	4 – Forest
215° to 225°	3 – Rangeland
225° to 235°	5 – Suburban areas, grassy
235° to 245°	5 – Suburban areas, grassy
245° to 255°	5 – Suburban areas, grassy
255° to 265°	5 – Suburban areas, grassy
265° to 275°	5 – Suburban areas, grassy
275° to 285°	5 – Suburban areas, grassy
285° to 295°	3 – Rangeland
295° to 305°	4 – Forest
305° to 315°	3 – Rangeland
315° to 325°	6 – Suburban areas, forested
325° to 335°	6 – Suburban areas, forested
335° to 345°	6 – Suburban areas, forested
345° to 355°	6 – Suburban areas, forested
355° to 5°	6 – Suburban areas, forested

Source: Orlando Utilities Commission (OUC) 2006.

Table 4.1.5. Physical characteristics of reactive gaseous divalent mercury (RGM)

Parameter	Value
Diffusivity in air (cm^2/s)[a]	6.0×10^{-2}
Diffusivity in water (cm^2/s)[b]	3.01×10^{-5}
Cuticular resistance (s/cm)[a]	1.0×10^{5}
Henry's law constant (pa-m^3/mol)[a]	6.0×10^{-6}

Sources: [a]Wesely 2002; [b]EPA 2004c.

Terrain elevations from 7.5-minute digital elevation models were extracted using the latest version of AERMAP (Version 04300). The elevated terrain option in AERMOD was used to process the terrain data generated by AERMAP.

The receptor grids used for the deposition modeling were consistent with GAQM recommendations and were defined as follows:

- Fence line receptors—Receptors placed on the site fence line spaced 164 ft apart.
- Near-Field Cartesian Receptors—Receptors between the center of the site and extending out to approximately 2 miles at 328-ft spacing.
- Mid-Field Cartesian Receptors—Receptors between about 2 miles and extending to approximately 4 miles at 820-ft spacing.
- Far-Field Cartesian Receptors—Receptors between 4 miles and extending to approximately 9 miles at 1,640-ft spacing.

The latest version of AERMET (Version 04300) was used to process surface meteorological data collected at the Orlando International Airport (OIA) and upper-air data from Tampa Bay/Ruskin. Raw surface and upper air data for the years 1996 to 2000 were obtained. Missing surface and upper air data (i.e., data gaps) were filled in accordance with EPA guidance. Precipitation, relative humidity, and surface pressure data were added to the processed AERMET files as required by AERMOD to compute wet deposition rates.

The results of the analysis are presented in Table 4.1.6. The predicted IGCC maximum annual areal average (i.e., average RGM deposition for receptors located within about 9 miles of the proposed IGCC) total (dry and wet) RGM deposition rate is 0.1374 µg/m^2 per year for the 5 years of historical meteorological data evaluated (i.e., 1996 through 2000). The dry and wet RGM deposition components of this total deposition rate, which occurred in 1996, are 0.1308 and 0.0066 µg/m^2 per year, respectively.

No observed data exist for total mercury deposition, which would have provided context for the estimated values. However, ***mercury deposition modeling was conducted by EPA using the Community Multi-Scale Air Quality model in the Technical Support Document for the Clean Air Mercury Rule (EPA 2005b). The total (wet and dry) mercury deposition was estimated to be 15-20 µg/m^2 per year for the Orlando area. Also,*** observed data do exist for total wet deposition of mercury (which, except in highly polluted urban atmospheres where particulate mercury can be important, is

Table 4.1.6. AERMOD model results—estimated reactive gaseous divalent mercury (RGM) concentration and deposition for the proposed IGCC facilities

Maximum Annual Impacts	Year of Meteorological Data				
	1996	1997	1998	1999	2000
Maximum Impacts					
Total Deposition (μg/m^2/yr)	0.8481	0.7411	0.8000	0.5714	0.6295
Dry Deposition (μg/m^2/yr)	0.8140	0.7000	0.7633	0.5464	0.5995
Wet Deposition (μg/m^2/yr)	0.0341	0.0411	0.0368	0.0250	0.0300
Receptor UTM Easting Coordinate (meters)	483,577	483,676	483,725	483,923	483,874
Receptor UTM Northing Coordinate (meters)	3,151,975	3,151,976	3,151,976	3,151,977	3,151,976
Distance From Unit B (meters)	1,023	1,024	1,028	1,067	1,054
Direction From Unit B (Vector o)	358	3	6	17	14
Concentration (ng/m^3)	0.00062	0.00062	0.00064	0.00052	0.00054
Receptor UTM Easting (meters)	483,527	483,725	483,923	483,973	483,874
Receptor UTM Northing (meters)	3,151,975	3,151,976	3,151,977	3,151,977	3,151,976
Distance From Unit B (meters)	1,026	1,028	1,067	1,083	1,054
Direction From Unit B (Vector o)	355	6	17	19	14
Aerial Average Impacts (within 15-km of Unit B)					
Total Deposition (μg/m^2/yr)	0.1374	0.1210	0.1287	0.1159	0.1222
Dry Deposition (μg/m^2/yr)	0.1308	0.1127	0.1224	0.1096	0.1168
Wet Deposition (μg/m^2/yr)	0.0066	0.0083	0.0062	0.0064	0.0055
Concentration (ng/m^3)	0.00011	0.00011	0.00011	0.00011	0.00011

*Based on modeled emission rate of 1000.0 g/s per CT/HRSG unit.
†Ratio of maximum emission rate (g/s) per CT/HRSG unit to modeled 1000.0 g/s emission rate.
‡Unadjusted AERMOD impact times emission rate factor.

Source: ECT, 2006.

largely driven by RGM scavenging) and ambient RGM concentrations (to which RGM dry deposition is directly related). Using such data, the estimated wet and dry components of total deposition can be assessed separately to provide context for the estimated values. The proposed IGCC estimated maximum annual areal average wet RGM deposition is compared to the observed annual wet deposition rate recorded in 2004 at the National Atmospheric Deposition Program ambient monitoring station (Station No. FL32) located approximately 8 miles north of the Stanton Energy Center (Figure 4.1.1). This monitor has collected data in the Orlando area since September 2003. Using 1997, the year of the estimated maximum annual areal average RGM wet deposition, the IGCC estimated maximum annual areal average wet RGM deposition rate of 0.0083 µg/m^2 per year is only 0.05% of the observed wet deposition rate of 17.7 µg/m^2 per year measured at this monitor (National Atmospheric Deposition Program 2006). Because observed dry RGM deposition data are not available, a comparison was made between the predicted IGCC maximum annual areal average ambient air RGM concentrations and measurements of RGM concentrations that have been conducted in Florida. The predicted IGCC maximum annual areal average RGM ambient air concentration is 0.00011 nanograms per cubic meter (ng/m^3), which is slightly less than 1% and slightly over 2% of the RGM ambient air concentrations observed in Florida of 0.015 and 0.005 ng/m^3 for sampling sites located in the Everglades and Pompano Beach, respectively (Malcolm and Keeler 2002; Malcolm et al. 2003).

The observed data are for 1-month sampling campaigns and are not directly comparable to the estimated annual average. Nevertheless, they provide some perspective on the predicted values, which are small in comparison.

Although maximum RGM concentrations and deposition rates predicted for a single receptor are considered less meaningful than the areal average values, the IGCC single point maximum annual deposition and annual-average concentration values are also summarized in Table 4.1.6. The IGCC estimated maximum single-point annual total (dry and wet) RGM deposition for the 5 years of historical meteorological data evaluated is 0.8481µg/m^2 per year. The dry and wet RGM deposition components of this total deposition rate are 0.8140 and 0.0341 µg/m^2 per year, respectively. This maximum annual total RGM deposition occurred with 1996 meteorological data at a receptor located near the Stanton Energy Center property boundary approximately 3,400 ft north of the proposed HRSG stack. The IGCC estimated maximum single-point annual-average RGM ambient air concentration is 0.00064 ng/m^3. This ambient air concentration occurred with 1998 meteorological data at a receptor located near the Stanton Energy Center property boundary approximately 3,400 ft north-northeast of the proposed HRSG stack.

Trace emissions of other pollutants from the proposed facilities would include vinyl chloride, sulfuric acid mist, hydrogen sulfide, hydrochloric acid, hydrofluoric acid, benzene, arsenic, and various heavy metals. The overall cancer and noncancer risks to humans from hazardous air pollutants are discussed in Section 4.1.9.1

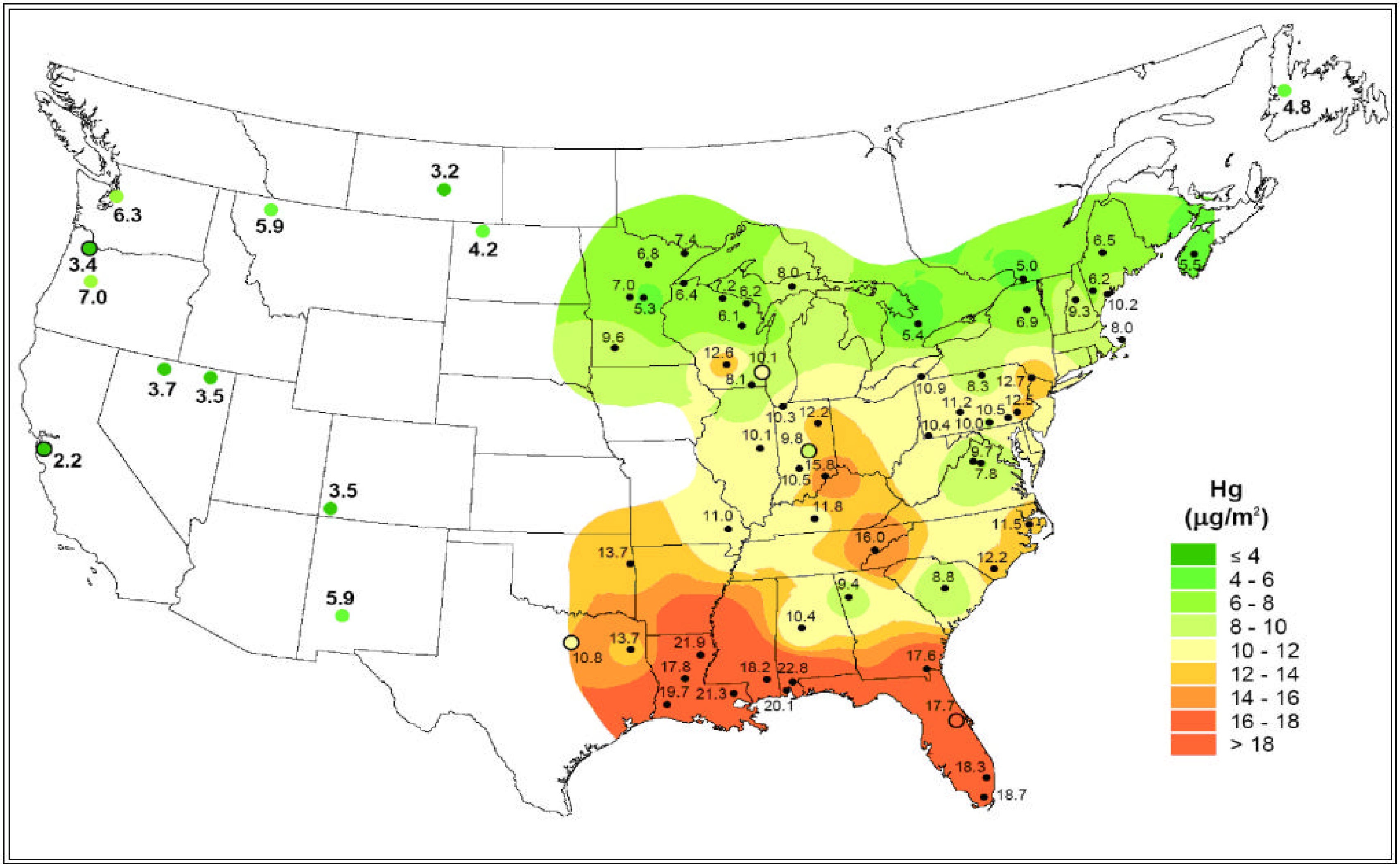

Figure 4.1.1. Mercury wet deposition measured in 2004

Odors

Some odors would be emitted during operation of the proposed facilities that would be noticeable on the site. Sources for these odors would include diesel engine exhaust from locomotives, trucks, maintenance equipment, and coal yard loaders; the coal pile and coal handling; sulfur storage and handling; and ammonia storage and handling. Any of these potential odors should be limited to the immediate site area and should not affect offsite areas.

Visibility

Visibility, or background visual range, is defined as the maximum distance a large, black object can be observed on the horizon. The scenic quality of natural landscapes and their color, contrast, and texture, are improved by good visibility. Visibility, as a measure of clarity of the atmosphere, has been established as an important air-quality-related value of national parks and wilderness areas that are designated as PSD Class I areas. Concentrations of pollutants from the proposed facilities would be negligible at the nearest PSD Class I area, about 90 miles to the west-northwest (Section 3.2.2), because dispersion of pollutants at that distance would reduce atmospheric concentrations to a small fraction of the maximum modeled concentrations, which are predicted to be less than PSD Class I increments at the location of their maximum impact. Consequently, no degradation in visibility would be perceptible.

Acidic Deposition

Acid rain, the popular name for acidic deposition, occurs when SO_2 and NO_x are chemically transformed and transported in the atmosphere and deposited on the earth's surface in the form of wet (rain, snow, fog) or dry (particle, gas) deposition. SO_2 and NO_x are readily oxidized in the atmosphere to form sulfates and nitrates. Subsequently, the sulfates and nitrates may form sulfuric acid and nitric acid when combined with water, unless neutralized by other chemicals present. Acidic deposition contributes to the acidification of lakes and damage to ecological resources. SO_2 and NO_x can be transported by the wind for hundreds of miles from one region to another. Therefore, air over any given area will contain some residual emissions from distant areas and infusions received from nearby areas. This continuing depletion and replenishment of emissions along the path of an air mass makes it extremely difficult to determine relationships between specific sources of emissions and acidic deposition at any particular location.

As a comparison to evaluate acidic deposition, estimated annual SO_2 emissions from the proposed facilities would be 162 tons, which would be about 1% of Orange County's SO_2 emissions inventory of 12,994 tons in 2001. As discussed earlier in this section, annual NO_x emissions from the Stanton Energy Center overall would not be expected to increase as a result of the proposed facilities. Because these SO_2 and NO_x emissions would be small or zero (respectively) percentage increases of existing county emissions, changes in acidic deposition, if any, would likely not be perceptible.

Global Climate Change

A major worldwide environmental issue is the likelihood of major changes in the global climate (e.g., global warming) as a consequence of increasing atmospheric concentrations of “greenhouse” gases (IPCC 2001). The atmosphere allows a large percentage of incoming solar radiation to pass through to the earth’s surface and be converted to heat energy (infrared radiation) that does not pass back through the atmosphere as easily as the solar radiation passes in. The result is that heat energy is “trapped” near the earth’s surface.

Greenhouse gases include water vapor, CO_2, methane, nitrous oxide, O_3, and several chlorofluorocarbons. The greenhouse gases constitute a small percentage of the earth’s atmosphere; however, their collective effect is to keep the temperature of the earth’s surface about 60°F warmer, on average, than it would be if no atmosphere existed. Water vapor, a natural component of the atmosphere, is the most abundant greenhouse gas. The second-most abundant greenhouse gas is CO_2, which has increased about 30% in concentration over the last century. Fossil fuel burning is the primary contributor to increasing concentrations of CO_2 (IPCC 2001). The increasing CO_2 concentrations likely have contributed to a corresponding increase in globally averaged temperature in the lower atmosphere, which has increased by about 1–1.4°F in the last hundred years (IPCC 2001).

Because CO_2 is relatively stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact of CO_2 emissions does not depend upon their source location on the earth. Instead, an increase in CO_2 emissions from a specific source is effective in contributing to global increases in CO_2 concentrations. Based on the proposed IGCC facilities operating at an 85% capacity factor during the year using synthesis gas, global CO_2 emissions resulting from fossil fuel combustion, which were estimated at 26,000 million tons for the year ***1999*** (IPCC 2001), would increase by about 1.8 million tons per year. ***A more recent study estimated global emissions of CO_2 from fossil fuel combustion to be 28,000 million tons in the year 2003 (Marland et al. 2006).***

4.1.3 Geology and Soils

Construction and operation of the proposed facilities would not change geologic conditions. A very low potential would exist for adverse effects to the facilities from geologic hazards (Section 3.3.4).

Because the new facilities would be built on a site in which about 5 ft of sandy fill material was deposited during construction of Unit 1 in the 1980s, proposed construction would not cause additional alteration of soil resources. Transmission line construction would disturb small areas of soils along the transmission line corridor. Potential impacts of soil disturbance on wetlands and ecological resources are discussed in Section 4.1.5.2 and Section 4.1.6, respectively.

4.1.4 Water Resources

4.1.4.1 Surface Water

Surface water resources would experience little or no direct impact as a result of proposed facility construction and operation. Facility operations would indirectly affect water volumes in the Econlockhatchee River and in wetlands downstream of the Orange County Eastern Water Reclamation Facility.

Construction

Stormwater runoff from construction sites can affect water quality. However, because facility construction would occur in developed site areas where surface water runoff is directed to onsite stormwater retention ponds and is used in the facilities, no impacts to natural surface waters would be experienced, except in the unlikely event of a major storm that caused overflow of the site stormwater collection system. Transmission line construction outside of the main plant area could result in soil erosion and sediment deposition to streams, but best management practices such as silt fencing, straw bales, and revegetation of graded areas would minimize erosion and sedimentation. If required, an erosion control plan would be developed and implemented to minimize impacts from construction. Accordingly, impacts attributable to construction-related runoff would be minimal.

During construction, accidental spills of materials such as fuels, lubricants, solvents, paint, or other liquids that could be detrimental to surface waters would be cleaned up in a timely manner and in accordance with a spill prevention, control, and countermeasure plan and best management practices. These measures would minimize any potential for the substances to enter streams.

Operation

Water required for facility operations (Section 2.1.5.2) would be obtained from reclaimed water and from groundwater. All water not lost to evaporation or otherwise consumed would be recycled within the Stanton Energy Center (Section 2.1.6.2). Because operation of the proposed facilities would not withdraw surface water or discharge liquid effluent, surface waters would experience no direct impacts. Makeup water for cooling the gasifier and the combined-cycle unit would be obtained from the onsite makeup pond and treated prior to use. Water for other facility needs would be obtained from onsite groundwater wells.

Cooling tower blowdown and other process wastewaters would be collected, treated as needed, and discharged to the existing Stanton Energy Center water treatment and reuse systems. Process wastewaters containing oils would be collected in an oily wastewater sump, where an oil/water separator would remove the oil. Chemical feed area spillage, tank overflows, and liquid from area washdowns would be routed to the waste neutralization system for pH adjustment. Stormwater would be directed to existing, onsite stormwater retention ponds. No effluents would be discharged off the site.

Facility operations ***could*** indirectly affect surface water by increasing the use of treated effluents from the Orange County Eastern Water Reclamation Facility. The Stanton Energy Center's use of ***reclaimed water from this facility*** would increase by an average of 2.2 million gal per day (from about 10.2 million gal per day currently to about 12.4 million gal per day), thus reducing by a similar amount the water volume discharged to the wetlands downstream from the Eastern Water Reclamation Facility and correspondingly from those wetlands to the Econlockhatchee River. Average daily releases to wetlands would be reduced from 4.2 million gal currently to about 2 million gal, with somewhat larger flow reductions during dry weather when less water would be received from the county landfill. ***Minimum water releases needed to sustain the wetlands hydrologically and as wildlife habitat are determined in consultation with wetlands scientists, and typically range between 0.4 and 1.0 million gal per day, depending on weather conditions (T. Madhanagopal and M. Gant, Orange County Utilities, telephone communication to D. Warren, Southern Company, and E. Smith, ORNL, February 28, 2006). Under drought conditions, adjustments might be necessary in order to maintain necessary flows to the wetlands while supplying the Stanton Energy Center's needs. However, during past droughts Orange County Utilities has not needed to restrict water delivery to the Stanton Energy Center (T. Madhanagopal and M. Gant, Orange County Utilities, telephone communication to D. Warren, Southern Company, and E. Smith, ORNL, February 28, 2006)***.

In the river, the flow reduction (3.4 ft^3/s on average) would be about 4% of the average flow at the nearest downstream gauging station (Section 3.4.1), but the flow reduction could increase the frequency and duration of no-flow episodes. Because surface water is not used for water supply, reduced flow would not affect water users. Water quality in the river could be affected if reduced streamflow also reduced the river's capacity to dilute contamination discharged from other parts of the watershed. Over time, ***the volume of water managed at the*** Eastern Water Reclamation Facility ***is*** expected to increase due to continued population growth (***which results in*** increased wastewater volume) in the facility service area, so any effects from reduced effluent discharge would be temporary.

4.1.4.2 Groundwater

Construction

Dewatering during facility construction, which would be conducted to support initial excavation, backfill, and subsurface construction, would affect shallow groundwater. A low-point well and ditch system would likely be used to lower the groundwater elevation on approximately 20 to 25 acres to below the depth of excavation. Collected groundwater would be pumped into the Stanton Energy Center stormwater system and subsequently would be routed to the onsite stormwater retention ponds for use in operations at the existing generating units. The well and ditch system would be closed and abandoned following the conclusion of subsurface construction activities.

The lowering of the water table would be temporary and would be limited to the unconfined surficial aquifer within a small area of the previously developed portion of the Stanton Energy Center property. Because no effect should be detected on wetlands, surface waters, or recharge to the Upper Floridan aquifer, impacts from lowering the water table would be inconsequential.

Water use for construction would have minimal effects. Service water for construction activities would be obtained from reclaimed water and potable water would be obtained from the existing Stanton Energy Center onsite wells. Construction water use from both sources would be a very small fraction of total water use at the site.

Operation

Proposed facility operations requiring high-quality water would increase the Stanton Energy Center's groundwater withdrawals from the Upper Floridan aquifer by about 0.1 million gal per day. The additional water would be obtained from existing onsite wells. Most of this water would be treated in an existing onsite demineralization facility to supply demineralized water to the gasifier and steam turbine. About 900 gal per day would be used for drinking water and other potable use.

Total withdrawals from the onsite wells (including withdrawals for existing uses) would be about 0.54 million gal per day on average (198 million gal per year), which would be less than the limits (2.0 million gal per day and 321.2 million gal per year) specified in the current Stanton Energy Center conditions of certification (OUC 2003). Previous modeling and other evaluation of these withdrawal limits (OUC 2001; SJRWMD 2001) found that groundwater withdrawal at the permitted rate would cause water level declines of less than 0.6 ft in the Upper Floridan aquifer, less than 0.1 ft in the Lower Floridan aquifer, and less than 0.08 ft in the unconfined surficial aquifer. A small amount of water would be returned to the unconfined surficial aquifer from operation of the onsite septic system. These small changes would not produce discernible impacts to surface waters, wetlands, or the position of interfaces between fresh water and salt water in the Floridan aquifer.

Facility operation could add localized contamination to shallow groundwater from the possible placement of additional waste in the onsite coal-combustion ash landfill (Section 4.1.8), as well as from operation of the onsite septic system. Because any contamination would be limited to the shallow aquifer and any contaminated groundwater would probably discharge to onsite stormwater collection systems, impacts to water users are unlikely. Aquatic biota could be exposed to contaminants in Stanton Energy Center ponds and collection basins, but contaminant types and concentrations would be similar to those currently present in these onsite water bodies (Table 3.4.1).

4.1.5 Floodplains and Wetlands Assessment

4.1.5.1 Floodplains

The 35 acres on which the proposed facilities would be constructed and the existing onsite landfill that would be used for ash disposal lie completely within the 1,100-acre developed portion of the Stanton Energy Center. This 1,100-acre tract was previously filled to an elevation higher than the

Federal Emergency Management Agency's determined 100- and 500-year floodplains (FEMA 2000). The corridor for the proposed transmission line interconnection to the existing electrical substation northeast of the principal existing facilities is not within the Federal Emergency Management Agency's determined 100- and 500-year floodplains (FEMA 2000). No construction would occur within a floodplain.

4.1.5.2 Wetlands Assessment

Project Description

DOE proposes to provide cost-shared funding for construction and operation of facilities at OUC's existing Stanton Energy Center near Orlando, Florida. DOE funding would support the coal gasifier, synthesis gas cleanup systems, and supporting infrastructure. The project would be integrated with a privately funded, combined-cycle unit. The facilities would convert coal into synthesis gas to drive a combustion turbine, and hot exhaust gas from the gas turbine would generate steam from water to drive a steam turbine. Combined, the two turbines would generate 285 MW of electricity. Under the no-action alternative, DOE would not provide cost-shared funding but the combined-cycle facilities would still be built on the site to operate using natural gas without the gasifier, synthesis gas cleanup systems, or supporting infrastructure.

Whether the combined-cycle unit would be built to use synthesis gas (under DOE's proposed action), or natural gas (under the no-action alternative), one new 230-kV transmission line would be required to connect the new generating facilities to an existing substation. The proposed route for the transmission line, within the buffer area in the northeast portion of the Stanton Energy Center site, would exit the proposed combined-cycle unit and follow an easterly alignment for approximately 900 ft. The line would then turn northeast for approximately 1,100 ft, where it would intersect a point just south of an existing electrical distribution line. The line would then turn to the north and parallel the existing distribution line to just south of the existing substation, where it would turn to the west for approximately 140 ft before turning to the north into a new substation bay at the substation. The total length of the transmission line would be approximately 3,200 ft. Figure 2.1.7 shows the location of the proposed transmission line within the Stanton Energy Center site; Figure 4.1.2 shows the land use/cover types, including wetland categories (explained in Section 3.5.2), within the proposed transmission corridor. Access to the transmission line would be from existing roads where practical, although a new access road would be required in most of the corridor.

Impacts

Construction of the proposed electrical transmission line between the proposed facility and the existing onsite substation would have wetland impacts. The width of the proposed transmission line corridor would be 80 ft. The corridor would traverse one upland habitat type, pine flatwoods (Section 3.6.1 and Figure 4.1.2), and two wetland habitat types, hydric pine savanna and cypress swamp (Section 3.5.2 and Figure 4.1.2). The total area of the corridor would be approximately 5.8 acres. The majority of the corridor (3.83 acres) is currently hydric pine savannah, while cypress swamp occupies 0.12 acre of the corridor, and pine flatwoods occurs in 0.63 acres. Also in the

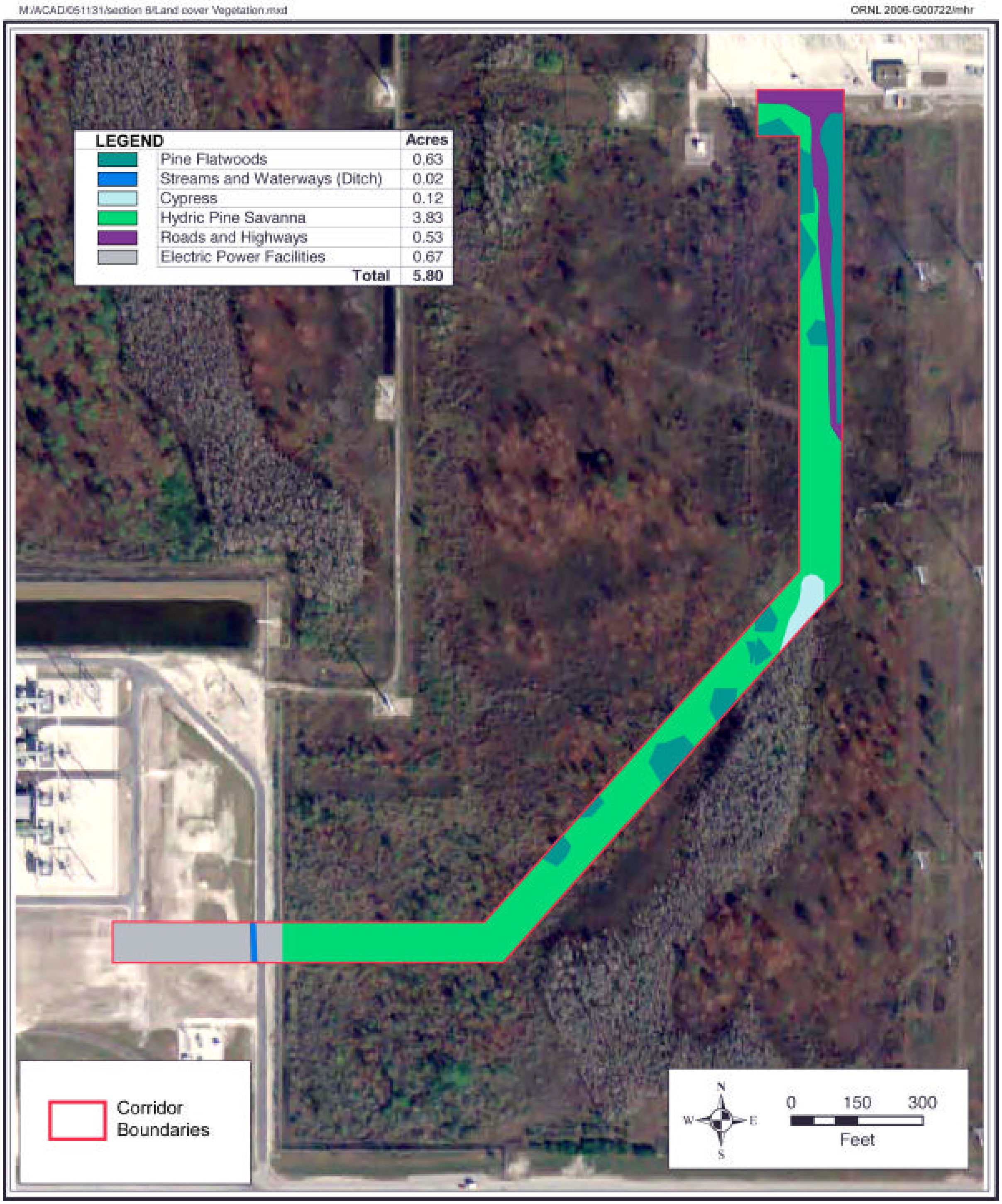

Figure 4.1.2. Land use/cover types, including wetland categories within the proposed transmission corridor

corridor are an old access road (0.53 acres), other electric power facilities (0.67 acres), and a small stretch of roadside ditch (0.02 acres). Within the corridor, all trees and tall-growing vegetation that could interfere with overhead lines would be removed.

The transmission line would be suspended from steel poles anchored by concrete pads. Some of the wetland areas within the corridor (0.06 acres of cypress swamp and 0.98 acres of hydric pine savanna) would be filled during construction of the pads and access road. The roadside ditch would not be disturbed. Corrugated metal pipe culverts would be installed in the new access road to prevent the disruption of any natural flow through the area.

Because tall-growing vegetation would be cut and kept at a height low enough to prevent interference with the conductors, forest cover habitats would be reduced and shrub or other low-growing vegetation would eventually dominate the corridor. Net wetland impacts would consist of 3.95 acres cleared, of which 1.04 acres would be filled. The transmission line and right-of-way would be maintained by mowing and brush-cutting at intervals of one or more years. Herbicides would be used in areas too wet for vegetation to be cut by mechanical means. In most cases, frequency of application would be one treatment every 3 to 5 years. Limited burning of cleared vegetation could occur.

The net effect of clearing and maintaining 3.95 acres of wetland habitat for the transmission line would be (1) loss of 1.04 acres of wetland due to fill and (2) modification of vegetation in wetlands in the remainder of the corridor due to right-of-way maintenance. This would shift, to a small extent, the balance of wildlife habitat in the area away from wetland and forest toward shrub and brushland. During the ***Section 404*** permitting process, an acceptable wetland functional assessment methodology (e.g., Wetland Rapid Assessment Procedure or Uniform Mitigation Assessment Method) would be used to determine the function loss resulting from the proposed impacts. The resultant vegetation communities in the corridor would be similar to those on other transmission line rights-of-way in the vicinity. Impacts to protected plants are discussed in Section 4.1.6.3. These and other unavoidable impacts would be mitigated as described below.

Alternatives and Mitigation Sequencing

Alternatives/Wetland Avoidance. A new transmission line would be required under either the proposed action or no-action alternative.

Because wetlands occur throughout the buffer area in the northeast portion of the Stanton Energy Center site, additional wetland impacts could be avoided only by placing the new transmission line parallel to an existing line through the area and sharing a common set of structures. Two such corridor route options were evaluated, ***but both*** were rejected as ***"practicable" alternatives [see 10 CFR 1022.14(a)]*** due to the risk of loss of output from two generators should there be a failure of a common set of structures.

Minimization of Direct and Secondary Impacts. A variety of measures would be used to minimize impacts to wetlands from construction and operation of the proposed transmission line, including:

- Access to the corridor would be from existing roads where practical rather than from construction of new roads.
- Clean, compacted native soil backfill with grass surface and side slope would be used for the access road and pads.
- The access road would not include an adjacent rim ditch.
- Geotextile fabric liner would be used to stabilize the access road and pads, as necessary.
- Best management practices for sediment and erosion control would be employed.
- Corrugated metal pipes would be installed in the access road to permit natural water flow through the area to continue.
- Chain saws and/or light, tracked shear machines would be used for clearing in wetland areas.
- Stumps and root mat would be left in place, except at structure foundation locations.
- Restoration would be conducted, as necessary, including grading of the soil and replanting or reseeding of disturbed areas.

Herbicides for right-of-way maintenance, which would be EPA- and state-approved, would be used in accordance with label instructions.

Compensatory Mitigation. Construction ***of the transmission line*** would require submittal of a joint (1) Corps of Engineers Section 404 dredge-and-fill wetlands application and (2) Florida Department of Environmental Protection environmental resource permit. This permitting/approval process would also require a compensatory mitigation plan, in addition to the measures listed above, for any unavoidable wetland impacts. Subsequent to the determination of wetland functional loss, a compensatory mitigation plan would be designed ***for the wetland area impacted by the construction of the transmission line. It is anticipated that the mitigation would entail the purchase of credits at a local mitigation bank (TM Econ Mitigation Bank). The total number of acres required to mitigate the wetlands impacts will be determined after deliberations between the FDEP, St. John's River Water Management District and the Army Corps of Engineers.***

4.1.6 Ecological Resources

4.1.6.1 Terrestrial Ecology

Except for the electrical transmission line interconnection, all proposed facilities would be constructed within the 1,100-acre tract of land that was previously cleared, leveled, and licensed for power plant use. This land was then planted with grass and is kept mowed. Although sometimes used by wildlife, the land contains no federally-listed threatened or endangered plant species and is not important habitat for wildlife. Most of the remaining 2,180 acres of the Stanton Energy Center site are undisturbed, providing a natural buffer between the existing and proposed industrial facilities and the surrounding offsite area. Thus, no areas of ecological sensitivity would be affected directly by construction of the proposed facilities and temporary construction laydown and parking areas. Indirect impacts (e.g., noise) to wildlife resources would result from construction activities and operation of the new permanent facilities.

The 3,200-ft onsite transmission line interconnection would have direct impacts to 0.63 acres of pine flatwoods upland habitat and 3.95 acres of wetland habitat (Section 4.1.5.2). Wildlife species typical to the area are present in the vicinity of the corridor and would be directly affected by construction activities and resultant loss of habitat. Smaller less mobile animals would be at greatest risk, whereas larger more mobile animals would likely move from the disturbed areas and increase utilization of surrounding habitats. A pre-construction ecological resources characterization program has been conducted on the site in support of the required Site Certification Application.

Indirect impacts to wildlife species in the vicinity of the proposed facilities could occur as a result of construction noise during the 28-month construction period. Noise levels typically associated with earthmoving equipment range from 73 to 96 dBA at a distance of 50 ft (FHWA 2005; Revelle and Revelle 1974). Small mammals and birds might be adversely affected by the maximum noise levels produced by construction equipment (Luz and Smith 1976; Brattstrom and Gondello 1983). Most of the animals would be away from the main plant area in the surrounding 2,180-acre natural buffer. Most construction activities would be at least 300 ft from the buffer area, and noise levels at the edge of the buffer would be correspondingly attenuated.

Because any wildlife species sensitive to noise would likely move away from the construction disturbance and reutilize habitats upon construction completion, no impacts on the hearing ability of wildlife species would be expected from construction-generated noise. The main proposed facilities would be located between existing Units 1 and 2 and Unit A in an area with noise levels typical of an operational power plant, where species present are adapted to the noise and human presence. Thus, because noise during proposed facility operations would be similar in character to existing noise and represent only a small addition to existing noise levels at the site (Section 4.1.10.2), the incremental noise would not impact wildlife.

The impacts on wildlife and vegetation from air emissions due to routine operations should be minor. For the criteria air pollutants SO_2, NO_2, PM-10, and CO, modeled estimates of increases in ground-level concentrations due to project emissions are very small (Table 4.1.1), and actual degradation of air quality should be less than the amounts predicted (Section 4.1.2.2). Trace elements and organic compounds***, such as those listed in Table 2.1.3,*** would be released at low concentrations and would be diluted further by atmospheric dispersion over a large geographic area, resulting in deposition amounts that should be below levels known to be harmful to wildlife and vegetation or to affect ecosystems through bio-uptake and biomagnification in the food chain (Will and Suter 1995; Suter and Tsao 1996; Jones, Suter, and Hull 1997; Sample, Opresko, and Suter 1996). In particular, maximum predicted ambient concentrations of mercury and beryllium would be less than 2% of their corresponding guideline values (Section 4.1.2.2).

Operation of the proposed mechanical-draft cooling tower has the potential to impact plants through local deposition of water and salts. The magnitude of such impacts was modeled in the Site Certification Application for the mechanical-draft cooling tower previously installed for Unit A. The proposed cooling tower is similar in design to the Unit A cooling tower, but is smaller (6 cells versus 10 cells). A potential effect of water deposition on vegetation is the increased threat of plant fungal diseases. The precipitation rate derived for the Unit A cooling tower, which was estimated conservatively (i.e., assuming no evaporation), was determined to be negligible (i.e., less than 0.1% of the average monthly rainfall of the driest month). Because water precipitation from the proposed cooling tower would be less, this amount would also be negligible. A salt deposition rate of 400 kg/km^2 or greater per month is generally sufficient to cause damage to vegetation (C. L. Mulchi, University of Maryland, personal communication to D.R. Wilkus, Black & Veatch, August 14, 1991), and this level is considered as a screening or trigger level of potentially significant deposition rates. Because the maximum salt deposition rate from the Unit A cooling tower was predicted to be 12 kg/km^2 per month, the lower deposition rate from the smaller proposed cooling tower is expected to have negligible impact on vegetation in the surrounding area.

Operation of the proposed flare (Section 2.1.2.8), which would be nearly invisible during the day, would create an altered visual environment at night when the 40-ft-high flame would be visible to active wildlife, as well as people nearby (Section 4.1.1.2). While birds are known to be attracted to lights and flares, no known incidents involving birds have been experienced during several years of occasional operation of a 180-ft-high flare at the Wabash River Coal Gasification Repowering Project (Amick 2005). As discussed in Section 2.1.2.8, the multipoint flare system was developed to resolve aesthetic issues associated with stack flares. Instead of a 100- to 200-ft single stack with a single flame that may rise several hundred feet above the stack, the multipoint flare divides the gas into a number of smaller flames. A 20-ft tall thermal barrier fence surrounds the burners, which are located approximately 10 ft above ground level. A multipoint flare system with burners only 10 ft above ground levelwas selected for the proposed gasification facilities rather than a single tall stack because it would be visible to a smaller, more localized area (i.e., birds several miles away from a flare would be less likely to see a ground-based flare than an elevated 180-ft-high flare), and should minimize any incidents with birds. Any impacts would occur infrequently because the flare would be operated only during gasifier startups and shutdowns and during plant upsets, which are anticipated to be uncommon.

4.1.6.2 Aquatic Ecology

The Stanton Energy Center site contains no appreciable natural aquatic resources (Section 3.6.2). The nearest major aquatic resource is the Econlockhatchee River, which is about 1 mile east of the nearest property boundary of the Stanton Energy Center and 2 miles east of the main construction area for the proposed facilities. During construction and operations, stormwater from the main proposed facilities would be routed via sheet flow (i.e., spread out at uniform depth across a flat surface, such as a parking lot) and directed to culverts and existing stormwater retention ponds. During construction of the transmission line interconnection, best management practices would be implemented for sediment and erosion control and stormwater handling, including use of silt fences and geotextile materials. Stormwater runoff from permanent structures associated with the interconnection would be negligible. The coal storage area would include a synthetic liner and would utilize existing leachate and runoff collection systems. Due to implementation of best management practices during construction of the facilities and the current plantwide system of stormwater collection and handling, impacts to aquatic ecological resources, including the riverine habitat of the Econlockhatchee River, would be highly unlikely.

Existing onsite facilities would be used for treatment of wastewater from the proposed facilities. Because no process waste streams or water treatment discharges would be released off the site, no aquatic ecological resources would be directly impacted.

4.1.6.3 Threatened and Endangered Species

No federally-listed threatened or endangered plant species are known to occur within the immediate vicinity of the main proposed facilities or the transmission line interconnection (OUC 2001). Impacts are unlikely to any such plants in the buffer area around the Stanton Energy Center from air emissions or altered stormwater drainage due to the relatively small output and dispersed nature of these discharges.

Five plant species protected by the Florida Department of Agriculture and Consumer Services (Table 3.6.1) are known to occur along or in the vicinity of the proposed transmission line corridor: Catesby's lily, cinnamon fern, royal fern, yellow-flowered butterwort, and hooded pitcher plant. Clearing and maintenance activities on the right-of-way would be expected to destroy some individuals, but populations would persist in undisturbed areas on and outside of the transmission corridor. Both cinnamon fern and royal fern are fairly common throughout Florida, and sparse populations were observed in hydric pine savanna and cypress swamp along the transmission corridor. Given their range in habitat, cinnamon and royal fern would be expected to persist along the undisturbed areas of the corridor following the construction of the transmission line.

Catesby’s lily is a perennial herb with alternate leaves and orange-pink flowers with darker freckles. It grows in wet flatwoods and bogs. Two populations of one or two plants each were seen growing in hydric pine savanna within the corridor. Catesby’s lily could potentially persist in the transmission line easement in areas where native shrub layers are not disturbed.

The insectivorous plants yellowflower butterwort and hooded pitcherplant occur along the proposed transmission line corridor. Yellowflower butterwort is a terrestrial plant with a basal rosette of yellowish-green leaves and yellow flowers. It occurs in flatwoods and bogs. Hooded pitcherplant is a perennial herb with erect leaves up to 3 ft in height. It has a green pitcher, which turns reddish in the sun and is marked with white spots. The pitcher has a broad arching hood over the mouth. The flowers are yellow and odorless. It occurs in flatwoods, bogs, and ditches. Only one population of yellowflower butterwort, consisting of approximately 25 plants, was discovered. It is located in hydric pine savanna along the proposed transmission line corridor. The hydric pine savanna was also observed to support several populations of hooded pitcherplant throughout. These insectivorous species could potentially persist along the new transmission line right-of-way within undisturbed areas.

Other than transient or incidental use by some wildlife species (e.g., sandhill crane, bald eagle), no federally-listed threatened or endangered animal species are found within the previously cleared

1,100 acres where all proposed facilities would be located, except for the transmission line interconnection. Use of existing facility areas by these species is indicative of habituation to the current industrial conditions.

Federal- or state-listed threatened or endangered or special status animal species (e.g., gopher tortoise) are present within or near the 2,180-acre buffer area (Table 3.6.1). Red-cockaded woodpeckers forage in the northern buffer area, but the closest nesting clans are at least 1,500 ft south and east of the main proposed construction area (DeLotelle & Guthrie, Inc. 2003) and about 5,000 ft from the proposed transmission line corridor. The closest known active bald eagle nest is more than 1.5 miles from the main proposed construction area and 0.5 miles from the transmission corridor. Because of the distance of most of the buffer area from the proposed facilities, the increased noise levels during construction and operations would be unlikely to impact these animals. No bald eagle nests, wading bird colonies, or red-cockaded woodpecker colonies are known to occur in the vicinity of the transmission corridor. These birds could possibly forage in or around the corridor's habitats, however. Snowy egrets and Florida sandhill cranes have been observed foraging in the transmission corridor. These species would probably avoid the corridor during construction of the transmission line facilities and resume some use of habitat in the right-of-way area upon completion of construction. Other listed species, such as gopher tortoises, have a low likelihood of occurrence in the corridor due to the predominance of wetlands and saturated soils.

Site-specific listed species surveys have been conducted as part of the Site Certification Application for the proposed facilities. Results indicate that no direct impacts are expected to listed species from proposed construction and operations, except for plants listed by the Florida Department of Agriculture and Consumer Services.

In compliance with Section 7 of the Endangered Species Act of 1973, as amended, DOE has consulted with the U.S. Fish and Wildlife Service regarding potential impacts of the proposed facilities on threatened and endangered species and designated critical habitats. Their response (Appendix A) included the following determinations:

Eastern indigo snake - May affect, not likely to adversely affect. The Service recommends use of the Eastern Indigo Snake Standard Protection Measures during construction.

Bald eagle - May affect, not likely to adversely affect. The Service recommends that the proposed 3,200 transmission line be constructed using appropriate spacing between power lines, and raptor deterrent devices to prevent electrocution of bald eagles and other large birds of prey.

Florida scrub jay - No effect. Due to the lack of suitable scrub habitat within the proposed project area, no adverse effects are anticipated.

Red cockaded woodpecker - May affect, not likely to adversely affect. As no suitable foraging area is found within the proposed project area, no adverse effects are anticipated.

Wood stork - May Affect, Not Likely to Adversely. Construction of the proposed facility is not anticipated to remove any quality foraging areas for the wood stork, and no colonies are situated within the energy center.

4.1.6.4 Biodiversity

With the exception of the corridor to be used for the transmission line interconnection, all proposed facilities would be constructed within an industrial area previously cleared and leveled for power generation. Consequently, the predominant impacts on biodiversity within this area occurred prior to planned construction of the proposed facilities. Within the proposed transmission line corridor, about 0.6 acres of pine flatwoods and 3.95 acres of wetland habitat type would be cleared, including 1.04 acres filled. Because of the large amount of these habitat types in the surrounding area, unique genetic information, rare species, or rare ecosystem components would not likely be lost. Thus, discernable impacts to biodiversity would not be expected.

4.1.7 Social and Economic Resources

The social and economic impacts of the proposed facilities would be most noticeable during the 28-month construction period, when an average of 350 additional workers would be on the Stanton Energy Center site. These impacts would peak during a 9-month period when 600 to 700 additional workers would be on the site. The project would also have additional short-term impacts by employing 72 additional operations workers during the 4.5-year demonstration period immediately following construction, and long-term impacts by employing 53 of the 72 demonstration workers as operations workers after completion of the demonstration. This section focuses on the short-term impacts of constructing and demonstrating the proposed facilities. Section 5 describes the long-term social and economic impacts of operating the facilities after the demonstration period to the extent that they would differ from the short-term impacts of demonstration.

In addition to the direct jobs that would be created by facility construction and operations, indirect and induced jobs would be created. Indirect jobs are those created by businesses that provide goods and services essential to the construction and operation of a project (e.g., building materials, construction equipment, maintenance supplies). Induced jobs are those created by businesses that provide goods and services purchased by the direct and indirect workers, but not directly related to the construction and operation of the project (e.g., food, clothing, housing).

Each direct job in Orange County generates about 1.65 indirect and induced jobs (Agency for Workforce Innovation 2005a). Based on this employment multiplier, the average of 350 direct jobs during the 28-month construction period could create as many as 578 indirect and induced jobs, for a total of 928 jobs in Orange County (Table 4.1.7). The 600 to 700 direct jobs during the 9-month peak construction period could create as many as 990 to 1,155 indirect and induced jobs, for a total of 1,590 to 1,855 jobs. Similarly, the 72 direct jobs during the 4.5-year demonstration period could create as many as 119 indirect and induced jobs, for a total of 191 jobs in Orange County.

The following subsections discuss the potential social and economic impacts of the proposed facilities, particularly those associated with direct, indirect, and induced employment during construction and demonstration.

Table 4.1.7. Potential employment related to construction and demonstration of the proposed facilities

	Average during construction period (28 months)	Peak construction period (9 months)	Demonstration period (4.5 years)
Direct employment	350	600 to 700	72
Employment multiplier[a]	1.65	1.65	1.65
Indirect and induced employment	578	990 to 1,155	119
Total employment	928	1,590 to 1,855	191

[a]Agency for Workforce Innovation 2005a.

4.1.7.1 Population

Construction

Because the proposed facilities would be located within Orange County's relatively large and diverse labor market, a minimal number of construction workers would be expected to relocate to the project area. Most of the construction workers already reside in or around Orange County and would commute daily from their homes to the construction site. Although workers would be unlikely to relocate from outside of the region, this analysis assumes as a conservative (upper-bound) estimate that 10% of the peak construction work force (60 to 70 workers) would relocate to Orange County (Table 4.1.8).

Table 4.1.8. Potential population growth related to construction and demonstration of the proposed facilities

	Peak construction period (9 months)	Demonstration period (4.5 years)
Direct employment	600 to 700	72
Percent relocating to the area	10%	20%
Workers relocating to the area	60 to 70	14
Percent relocating with family	40%	70%
Workers relocating with family	24 to 28	10
Average household size	2.46	2.46
Total relocating workers and family	59 to 69	25
Workers relocating without family	36 to 42	4
Total potential population growth	95 to 111	29

Past experience with large, multi-year power plant construction and refurbishment projects indicates that approximately 60% of the in-migrating work force is accompanied by family, while the remaining 40% is not (NRC 1996). However, for this relatively small, 28-month construction project, a more reasonable assumption is that only 40% of the construction workers relocating to the area (24 to 28 workers) would be accompanied by family.

Assuming that 36 to 42 construction workers would relocate without families and that 24 to 28 construction workers would relocate with families, and assuming an average household size of 2.46 persons for Florida (U.S. Census Bureau 2005), the permanent population in Orange County could increase by about 95 to 111 persons as a result of direct construction employment (Table 4.1.8). This population growth would represent about 0.01% of Orange County's 2004 population of 989,926. The potential impacts of this population growth are discussed in Section 4.1.7.3 (Housing) and Section 4.1.7.4 (Public Services).

The indirect and induced jobs that would be created during facility construction would be less specialized than the direct construction jobs, and would be even more likely to be filled by existing area residents. Accordingly, this analysis assumes that none of the indirect or induced work force would relocate to the area during facility construction.

Operation

As with construction, only a small portion of the 72 operations workers associated with the demonstration would be expected to relocate to the project area; accordingly, this analysis assumes that most of them already reside in or around Orange County and would commute daily from their homes to the facilities. Although workers would be unlikely to relocate from outside of the region, this analysis assumes as a conservative estimate that 20% of the demonstration work force (14 workers) would relocate to Orange County (Table 4.1.8). The analysis assumes a higher percentage of relocating workers for demonstration than construction because: (1) the demonstration period (4.5 years) would be longer than the construction period (28 months) (i.e., workers would be more likely to relocate for work of longer duration); (2) the demonstration period would require more specialized positions that might need to be filled with workers from outside of Orange County; and (3) most of the demonstration personnel (53 of 72) would remain at the facilities for long-term operations after a successful demonstration. For these same reasons, this analysis assumes that a higher percentage of the demonstration workers relocating to the area (70% or 10 workers) would be accompanied by family.

Therefore, assuming that 10 of the demonstration workers would relocate with families and that 4 would relocate without families, and assuming an average household size of 2.46 persons, the permanent population in Orange County could increase by about 29 persons as a result of facility demonstration. This population growth would represent less than 0.003% of Orange County’s 2004 population of 989,926. The potential impacts of this population growth are discussed in Section 4.1.7.3 (Housing) and Section 4.1.7.4 (Public Services).

The indirect and induced jobs that would be created during facility demonstration would be less specialized than the direct demonstration jobs, and would be even more likely to be filled by existing area residents. Accordingly, this analysis assumes that none of the indirect or induced work force would relocate to the area during facility demonstration.

4.1.7.2 Employment and Income

Construction

The 1,590 to 1,855 total jobs (600 to 700 direct plus 990 to 1,155 indirect and induced) that would be created during the peak construction period would represent less than 0.4% of the total labor force (528,779) in Orange County in 2004. Because most of these direct, indirect, and induced jobs would be filled by workers who currently reside in or around Orange County, construction would have a short-term positive effect on employment in the region.

Wages from facility construction would also have a positive effect on total and per capita income in the region. Assuming the average hourly wage for entry level ($10.75) and experienced ($16.33) construction trades in the Orlando area in 2004 (Agency for Workforce Innovation 2005b) and a 40-hour work week, the total direct payroll for the construction work force (600 to 700) during the 9-month peak construction period would range from $10.1 million to $17.8 million. The total direct payroll for the average construction work force (350) over the entire 28-month construction period would range from $18.2 million to $27.7 million. Further, assuming the current minimum wage in Florida of $6.15 per hour (U.S. Department of Labor 2005) and a 40-hour work week, the total payroll generated by the 578 indirect and induced jobs during the 28-month construction period would be over $17.2 million.

Operation

The 191 total jobs (72 direct plus 119 indirect and induced) that would be created during the demonstration period would represent less than 0.04% of the total labor force (528,779) in Orange County in 2004. Because most of these direct, indirect, and induced jobs would be filled by workers who currently reside in or around Orange County, demonstration would have a short-term positive effect on employment in the region.

Wages from facility demonstration would also have a positive effect on total and per capita income in the region. Assuming the average hourly wage for entry level ($18.66) and experienced ($27.38) power plant operators in the Orlando area in 2004 (Agency for Workforce Innovation 2005b) and a 40-hour work week, the total direct payroll for the operations work force (72) during the 4.5-year demonstration period would range from $11.2 million to $16.4 million. Assuming the current minimum wage in Florida of $6.15 per hour (U.S. Department of Labor 2005) and a 40-hour work week, the total payroll generated by the 119 indirect and induced jobs during the 4.5-year demonstration period would be over $6 million.

4.1.7.3 Housing

Because most of the direct, indirect, and induced jobs during facility construction and demonstration would be filled by workers who currently reside in or around Orange County, demand for housing in the region would not increase appreciably. Housing for the 60 to 70 new construction-related households (i.e., the workers relocating with and without families) assumed as an upper bound in this analysis would represent less than 0.2% of the 33,525 vacant housing units in Orange County in 2004. Similarly, the 14 new demonstration-related households would represent less than 0.04% of the county's vacant housing in 2004. These levels of increased demand would not be likely to have an adverse effect on the availability or cost of housing in Orange County, particularly given the increase in the county's housing stock since 1990.

Because the relatively small increase in demand for housing associated with the proposed facilities would not likely affect housing availability or cost in Orange County, it also would not likely increase residential property values. Conversely, because the proposed facilities would be located entirely within the existing Stanton Energy Center site, construction and demonstration would not likely decrease residential property values in the area. This is particularly true given the extensive amount of relatively expensive residential development that has occurred immediately north of the Stanton Energy Center’s northern boundary in the past 20 years.

4.1.7.4 Public Services

Water and Wastewater Services

Because most of the direct, indirect, and induced jobs during project construction and demonstration would be filled by workers who currently reside in the area, demand for water and wastewater services in Orange County would not increase appreciably. OUC and the Orange County Utilities Department have adequate water supplies to meet the additional demand from 60 to 70 new construction-related households and 14 new demonstration-related households. Similarly, Orlando’s Public Works Department and the Orange County Utilities Department have adequate wastewater treatment capacity to meet this additional demand. Given that most of these relocating workers would rent or purchase existing housing units rather than build new ones, their additional demand for water and wastewater services would likely result in only a few new water or sewer connections.

Police Protection

As discussed in Section 4.1.7.1, population growth associated with construction and demonstration of the proposed facilities would be minimal, representing less than 0.01% of Orange County's population in 2004. Given such a small population increase, facility construction and demonstration would not create an additional need for police protection.

Fire Protection and Emergency Medical Services

As with police protection, the relatively small population increase and housing demand associated with construction and demonstration of the proposed facilities would not create an additional need for fire protection or emergency medical services.

Schools

Because population growth associated with facility construction and demonstration would be minimal, little effect on the Orange County Public School District would normally be expected. However, Orange County's public schools are already above capacity (Section 3.7.4.4), and even a small increase in the number of students would contribute to the existing problem. The Orange County Public School District plans to renovate or replace 136 of its schools, and expects that these measures will provide excess capacity by the 2010–11 school year (Orange County Public School District 2005). These school upgrades might not occur in time to help meet the additional demand created by the proposed facilities, however, as the peak construction period would occur from fall 2008 through spring 2009. The impact of this additional demand on the local school system would be mitigated somewhat by the taxes paid by Southern Company to the Orange County Public School District. In 2004, these school tax payments totaled $990,180 (Section 3.7.5).

Health Care

Given the small population growth associated with construction and demonstration of the proposed facilities, an additional need for health care facilities would not be likely. The existing health care facilities in Orange County would easily handle an accident associated with facility construction or demonstration.

4.1.7.5 Local Government Funds and Expenditures

As discussed in Section 3.7.5, OUC is exempt from paying property taxes in Orange County. However, Southern Company would pay several types of local taxes (Table 3.7.6) based on its partial ownership of the proposed facilities. No information is yet available on the amount of local taxes that Southern Company would pay on the proposed facilities but, as a rough indication, the company paid over $2.4 million in local taxes in 2004 for its 65% equity share in the existing Unit A.

4.1.7.6 Environmental Justice

Orange County and most of the ***eight*** census tracts around the Stanton Energy Center have higher minority percentages than the state of Florida and the United States (Section 3.7.6). Census Tract 167.22, which includes the population of the Florida Department of Corrections' Central Florida Reception Center and in which the proposed facilities would be located, has a slightly higher minority percentage (45.7%) than Orange County (42.5%), and a much higher minority percentage than both the state of Florida (34.6%) and the United States (30.9%). Therefore, the relatively large minority populations in and around Census Tract 167.22 represent "environmental justice" populations to which ***potential*** adverse impacts of constructing and operating the proposed facilities could be distributed disproportionately.

Conversely, Orange County and ***seven*** of the ***eight*** census tracts evaluated have lower percentages of people below the poverty level than the state of Florida and the United States as a whole. Census Tract 167.22 has a much lower percentage of people below the poverty level (3.5%)

than Orange County (12.1%), the state of Florida (12.5%), and the United States (12.4%). Only Census Tract 166.02 has a higher percentage of people below the poverty level (16.3%) than the county, state, and nation, but the difference is not large enough to classify Census Tract 166.02 as an "environmental justice" population on the basis of poverty. Therefore, none of the populations in and around Census Tract 167.22 represent "environmental justice" populations on the basis of poverty.

As discussed in Section 1.5, DOE made efforts to engage the public, including the minority and low-income populations in the census tracts around the Stanton Energy Center, through the NEPA public involvement process. In addition to those efforts directed at the general public, DOE focused efforts in and around the environmental justice population identified as Census Tract 167.22 by distributing flyers in the community announcing both the scoping meeting and the hearing on the Draft EIS, as well as mailing postcards to local residents, businesses and institutions (e.g. the correctional center) within a 2-mile radius of the Stanton Energy Center.

Pursuant to Executive Order #12898, the analysis in this section examines the potential for the proposed action to subject the minority community in and around Census Tract 167.22 to disproportionately high and adverse environmental effects. The resource areas of greatest concern in this analysis are considered to be land use/aesthetics, air quality emissions and odors, water quality, health effects, noise, and socioeconomics.

As discussed in Section 4.1.1, the impacts to land use and aesthetics would not be significant for the population as a whole and therefore there would be no disproportionate impacts. With regard to air quality, the analysis in Section 4.1.2 shows that there would be no significant increases in either criteria or hazardous air pollutants; any odors would be limited to the site area and should not affect the surrounding community. Regarding water resources (Section 4.1.4), while the proposed action would contribute to the regional increase in groundwater withdrawals, there would be no disproportionate effect on the quality or availability of water resources for the environmental justice population. Likewise, with regard to health effects ((4.1.9) and noise (4.1.10) there would not be significant adverse impacts to the population as a whole and, therefore, no disproportionate adverse effects. Finally, as discussed earlier in this section (Section 4.1.7), construction and operation of the proposed facilities would not create adverse impacts to most social and economic resources in the census tracts evaluated; however, there is the potential for a major cumulative impact to traffic flow on the local road network (Section 4.1.7.7). Without appropriate mitigation, this impact on local traffic flow and safety could represent a disproportionately high and adverse impact to the minority population in Census Tract 167.22. These impacts would be reduced if the Avalon Park Boulevard extension is completed in mid-2008, before the peak construction period. Also, Southern Company and OUC have committed to a number of measures that would mitigate these potential traffic impacts (Section 4.1.7.7).

4.1.7.7 Transportation

Roads

Construction. As discussed in Section 3.7.7.1, primary road access to the Stanton Energy Center is from the north via Alafaya Trail, a two-lane minor arterial road with an existing "F" level-of-service. Although the Avalon Park Boulevard extension project (also known as Innovation Way) and the widening of Alafaya Trail to four lanes are expected to improve the local road network considerably in the next few years (Section 3.7.7.1 and Section 6), work on these projects has not yet begun. Given the possibility of even minor delays, which are common in major road construction projects, these projects might not be completed in time to alleviate traffic flow during the peak construction period for the proposed facilities (fall 2008 through spring 2009). Much of the work on the road projects could coincide with construction of the proposed facilities, creating a major cumulative impact to traffic flow on the local road network (Section 6).

To provide a conservative assessment of the potential impacts of the proposed facilities on the local road network, this analysis assumes that the Avalon Park Boulevard extension project would not be completed on schedule (i.e., mid-2008) and that the widening of Alafaya Trail to four lanes would not be completed until 2009 or 2010. Further, this analysis assumes that all of the 350 workers during the average construction period for the proposed facilities and all of the 600 to 700 workers during the peak construction period would access the project site via Alafaya Trail as currently configured. Based on past traffic assessments for construction projects at similar power plants, this analysis assumes an average vehicle occupancy rate of 1.4 persons per vehicle, in which the average construction work force would generate about 250 daily round trips and the peak construction work force would generate about 429 to 500 daily round trips.

Regular work hours for construction of the proposed facilities would be weekdays from 6:30 a.m. to 5:30 p.m. Therefore, southbound construction traffic coming to the facility site in the morning would arrive before the peak morning traffic period on Alafaya Trail. As discussed in Section 3.7.7.1, a total of 999 northbound trips were measured during the peak afternoon traffic hour on Alafaya Trail near the Stanton Energy Center in 2003. Thus, the additional northbound afternoon traffic associated with the average construction work force (250 trips) would represent a 25% increase in northbound peak-hour afternoon traffic on Alafaya Trail. Similarly, the additional traffic associated with the peak construction work force (429 to 500 trips) would represent a 43% to 50% increase in northbound peak-hour afternoon traffic on Alafaya Trail.

In addition to the construction workers in their personal vehicles, heavy construction vehicles would access the site from Alafaya Trail during various stages of facility construction. However, upon reaching the site, most of these vehicles would remain for the duration of construction. Because these heavy construction vehicles would not make daily trips to and from the site, their relative impact on the local road network would be minimal.

Because Alafaya Trail already operates at an "F" level-of-service, the additional traffic generated during both the average and peak construction periods would have a considerable impact to traffic flow on the local road network. This impact would be reduced if the Avalon Park Boulevard extension is completed in mid-2008 before the peak construction period.

To address the impacts of facility construction on the local road network, Southern Company and OUC have committed to encourage workers to carpool, use other transit programs, and drive to and from work during off-peak times to the extent possible. In addition, as a condition of the state of Florida's certification of the proposed facilities, Southern Company and OUC ***are*** required to develop a program for mitigating traffic impacts. The conditions included in the Conditions of Certification for the ***proposed project*** specifies the following:

> "OUC et al shall develop and implement at its own expense a construction traffic impact mitigation program, after consultation with the Florida Department of Transportation (DOT), and report that will be submitted to DOT prior to commencement of construction of Stanton Unit 2. The program will detail the actions that OUC et al will take to reduce the impacts of construction traffic, which report shall address the following actions:
>
> 1. OUC et al shall actively promote and encourage carpooling by construction companies and workers, including contractors and subcontractors, from whom it obtains construction services, and OUC shall further explore with appropriate public mass-transportation providers in the area the possibility of park-and-ride service to the site.
> 2. OUC et al shall utilize to the extent practicable the existing railway access to the Stanton site for the delivery of equipment and materials needed for the project construction.
> 3. OUC et al will explore with its contractors and subcontractors the practicability of staggering construction employee work schedules, and encourage the staggering of shifts to the extent feasible to mitigate peak hour traffic congestion problems.
> 4. OUC et al will consult with the appropriate Winter Park DOT personnel regarding the practicality of providing temporary traffic control devices and alteration of signal times to assist in maintaining proper traffic flow at the most affected intersections, which are the intersections of Alafaya Trail with both the East-West Expressway and State Road 50.
> 5. OUC et al shall suggest and encourage the use by construction personnel of alternate public road access to the Stanton site as appropriate to alleviate traffic congestion."

Any program developed to mitigate the impacts of facility construction on traffic flow and safety on the local road network would include, at a minimum, the measures described above from the Conditions of Certification for the ***proposed project***.

Operation. This analysis assumes that all of the 72 demonstration workers would access the proposed facilities from Alafaya Trail and that their average vehicle occupancy rate would be 1.1 persons per vehicle. During the demonstration period, two 12-hour shifts would be established, with workers arriving and leaving each morning and afternoon between 5:00 and 6:00. Because the daytime shift would consist of 57 employees, the projected number of additional southbound trips on Alafaya Trail in the morning would be about 52. These trips would not create a major impact to traffic flow on Alafaya Trail because they would occur before the peak morning traffic period. However, the 52 additional northbound trips generated by these workers each afternoon, which would occur close to the peak afternoon traffic hour on Alafaya Trail, would represent a 5% increase in northbound traffic from the current level of 999 trips during that period. The 15 employees on the nighttime shift would generate about 14 additional trips traveling in the opposite direction of the daytime shift. The additional trips would represent slightly over a 1% increase in southbound traffic from the current level of 972 trips during the peak afternoon traffic hour (Section 3.7.7.1).

In addition to workers' personal vehicles, trucks would generate traffic on Alafaya Trail by delivering materials to the proposed facilities and removing gasification ash, elemental sulfur, unconsumed anhydrous ammonia, and other byproducts from the facilities. Approximately 40 trucks per week would be required for normal deliveries of supplies (mostly on weekdays), 3 trucks per week would transport the sulfur byproduct, and 6 trucks per week would transport the ammonia. Thus, the total number of additional non-employee trips to and from the proposed facilities would be about 50 per week, excluding ash transport. Many of these trips would likely occur during off-peak traffic hours. Because markets for commercial application of the gasification ash have not been finalized, the number of trucks, if any, required for offsite ash transport is not known. If all of the ash were marketed off the site, 160 truck loads would leave the Stanton Energy Center each week. Because existing truck traffic to and from the Stanton Energy Center is about 600 per week, the additional truck traffic associated with the proposed facilities would represent an increase of between 22% (130 trips) and 48% (290 trips).

Combined, the additional traffic generated by workers and delivery trucks would have a noticeable impact to traffic flow on the local road network. This impact would be reduced if the Avalon Park Boulevard extension is completed on schedule in mid-2008, and reduced even further if the widening of Alafaya Trail to four lanes is completed on schedule in 2009. However, if work on these road projects coincides with demonstration of the proposed facilities, a noticeable cumulative impact resulting from traffic congestion on the local road network would continue (Section 6). Southern Company and OUC are considering transporting the sulfur, ammonia, and/or gasification ash off the site by rail as an alternative to using the local roads. Other possible mitigation measures are identified above in the discussion of potential impacts associated with construction-related traffic.

Railways

Construction of the proposed facilities would not affect the existing CSX Transportation rail spur that provides access to the Stanton Energy Center. Some deliveries of large construction equipment could be made via rail, which would generate a minimal amount of additional rail traffic.

Demonstration of the proposed facilities would require 2 to 3 additional train loads of coal per week delivered via the existing CSX Transportation rail spur on the Stanton Energy Center site. This small increase in rail traffic would not likely impact the local rail network. If sulfur, ammonia, and/or gasification ash were transported off the site by rail, the impact on the local rail network from the associated increase in rail activity would likely be minimal.

4.1.7.8 Cultural Resources

Construction and operation of the proposed facilities would not affect cultural resources because the facilities would be sited within an area that previously has been disturbed and the four documented resources within the Stanton Energy Center boundaries are not located within that area (Figure 3.7.2). In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, DOE has consulted with the Florida SHPO regarding a determination of the potential for impacts associated with the proposed facilities on any historic resources that may be listed in or eligible for the *National Register of Historic Places* or that may have local importance. The SHPO has stated that the proposed facilities would have no effect on historic properties (Appendix B). However, as a condition of the state of Florida's certification of the proposed facilities, Southern Company and OUC would likely be required to notify the Florida Department of Environmental Protection and the SHPO if any historical or archaeological artifacts are discovered at any time within the project site. A similar provision is included in the Conditions of Certification for the existing Stanton Energy Center units.

4.1.8 Waste Management

4.1.8.1 Construction

Waste from construction of the proposed facilities would include excess materials, metal scraps, and pallets, crates, and other packing materials. Excess supplies of new materials would be returned to vendors or retained for future use. Surplus paint and other consumables, partial spools of electrical cable, and similar leftover materials would also be retained for possible future use in maintenance, repairs, and modifications. Other scrap materials could be recycled through commercial vendors. Because the main proposed facilities would be sited on land that has been cleared and leveled with fill material, land preparation for those facilities would produce minimal waste. Any excavated material could be used as fill on the site. Cleared vegetation from preparation of the transmission line right-of-way and debris from installation of the line would be chipped and burned on the site or transported to the Orange County Sanitary Landfill for disposal. Any onsite chipping and burning would require an open burning permit from the Orange County Fire Rescue Department, which would minimize wildfire risk and limit impacts from smoke and odor.

The Orange County Sanitary Landfill (Section 3.8) would have ample capacity to receive project construction wastes. Because the quantity of waste from project construction would be small in comparison with the landfill capacity and waste quantities routinely handled, disposal of these wastes should have negligible impact.

During construction, no hazardous waste generation would be anticipated. In the unlikely event that buried hazardous waste is discovered on the project site during construction, the waste would be reported to appropriate agencies and removed using a commercial hazardous waste management contractor (Section 3.8).

4.1.8.2 Operation

Solid wastes and byproducts from facility operation would include gasification ash, anhydrous ammonia, elemental sulfur, chemical cleaning residues, other residues from water treatment and air emission control systems, and miscellaneous industrial refuse.

Annual production of gasification ash would be about 68,000 tons. Impacts associated with this material would depend on its ultimate disposition. Gasification ash could be transported for disposal in the onsite landfill, where it would increase annual disposal volume by about 14%. However, gasification ash has been evaluated for several possible beneficial uses that could avoid such disposal. These uses include combustion in the Stanton Energy Center's existing coal-fired generating units, sale for use as fuel in a cement production kiln, and sale for use as a precursor for activated carbon (beneficiation by chemical activation and acid washing could make the material suitable for use in flue gas treatment and similar applications). All of these options are technically feasible, but operational factors could limit their implementation, and specific markets have not yet been identified for use as either an activated carbon precursor or a cement-kiln fuel. If the ash were burned as fuel in one of the Stanton Energy Center's existing coal-fired units, its energy value (estimated at 8 million Btu per ton) would be recovered and the amount of coal combustion ash available from Units 1 and 2 for commercial sale would increase by about 47,000 tons per year from the current 180,000 tons per year (Section 3.8) to 227,000 tons per year (based on the assumption that unburned carbon, which would be consumed by burning, constitutes 31% of the gasification ash). Coal requirements for the existing units would be reduced by approximately 1% to 693,000 lb per hour. Sale of the material for use as cement-kiln fuel also would recover the material's energy value, reduce the cement kiln's requirements for other fuels, and avoid disposal at the Stanton Energy Center landfill. Sale for use as an activated carbon precursor would reduce raw material requirements for the activated-carbon producer that buys the material and would avoid disposal at the Stanton Energy Center landfill. Transport for offsite reuse of the gasification ash would require approximately 160 truck loads per week; fewer train shipments (about seven 100-car trains annually) would be needed if rail transport were used.

Gasification ash would be transported for disposal in the onsite landfill only if no beneficial use were found. Disposal of gasification ash would increase the waste volume placed in that landfill, but would not change other potential impacts associated with the landfill. The 347-acre onsite area dedicated for landfill use would provide more than enough space to dispose of the material generated by the proposed facilities during the 4.5-year demonstration period, as well as other coal combustion wastes generated by the Stanton Energy Center during the same period. In the unlikely event that all of the gasification ash generated during the demonstration period required disposal, the additional material would occupy no more than about 1% of the total disposal capacity at the landfill site.

The gasification ash would not be considered a hazardous waste. It would be similar in most characteristics to ash from the Stanton Energy Center's existing coal-fired generating units. Testing of simulated waste indicates that this material probably could be handled in the same manner as the existing ash (OUC 2006). However, because physical and mechanical properties would be somewhat different, facility operators might need to adopt somewhat different handling procedures for this material in order to limit windblown dust and avoid mechanical instability within the waste disposal area.

About 7,300 tons of anhydrous ammonia would be produced annually by the proposed facilities. The existing Stanton Energy Center generating units would use the ammonia to satisfy their requirements, and any excess would be sold commercially. Because this chemical has many uses in agriculture and industry, markets should easily absorb any production in excess of onsite needs.

About 2,800 tons of elemental sulfur would be produced annually. If this material proves to be as pure as it is projected to be, it would be sold commercially. Because sulfur has numerous uses in agriculture and industry (more than 10 million tons are consumed annually in the United States) and because U.S. consumption exceeds domestic production (all of which is byproduct material from environmental control systems) (Ober 2002), the market should easily absorb the quantity that the proposed facilities would generate during the demonstration.

If the sulfur were not sufficiently pure for commercial sale, it would be placed in the onsite landfill. Elemental sulfur would not be a hazardous waste, and the quantity produced would be small in comparison with the total capacity of the landfill. However, disposal of this material could necessitate special handling procedures to assure appropriate containment in order to avoid adverse impacts on waste stability or leachate chemistry. Leaching studies on a mixture of elemental sulfur and coal combustion ash found that this combination promotes production of acidic leachate and release of trace metals from the ash, leading to a recommendation to isolate disposed sulfur from other materials in a landfill (Boegly, Francis, and Watson 1986).

The activated carbon sorbent used to remove mercury from gasification facility emissions would be ***managed as a hazardous material. It would be*** tested to determine whether it requires management as a hazardous waste under the Resource Conservation and Recovery Act (RCRA). Following testing, it would be returned to the manufacturer for treatment and recycling or managed ***offsite*** by a commercial hazardous waste contractor (Section 3.8). Existing processing facilities should have adequate capacity to manage this low-volume waste stream (estimated at about 250 yd^3 every 12 to 18 months), and management in accordance with applicable regulations should minimize potential adverse impacts.

Results of testing of similar materials with much lower mercury loadings suggest that the mercury-bearing activated carbon might not be a hazardous waste and might produce ***only*** very low concentrations of mercury in landfill leachate. Leachability testing of mixtures of coal ash and activated carbon from projects that demonstrated the use of activated carbon injection for mercury control found low but variable rates of mercury release from the material (Senior et al. 2003). Mercury concentrations ranged from undetectable (less than 0.01 µg/L) to 0.07 µg/L in waste extracts generated with the Toxicity Characteristic Leaching Procedure (TCLP), which is prescribed in regulations under RCRA and is designed to mimic leaching conditions in a municipal solid waste landfill. Values ranged from undetectable up to 0.05 µg/L using the Synthetic Groundwater Leaching Procedure, which is more representative of the less aggressive leaching conditions in a coal-combustion ash landfill. All reported mercury concentrations were well below potentially applicable criteria, including the primary drinking water standard of 2 µg/L, water quality criteria for protection of aquatic life (1.4 µg/L for acute exposure and 0.77 µg/L for chronic exposure) (EPA 2002), and the threshold for identifying a material as a hazardous waste (200 µg/L). Only one of the ash sources in the study produced extracts with detectable mercury concentrations. The proposed facilities would use sulfur-impregnated activated carbon in the mercury removal process, which means that mercury would likely be captured in the form of mercuric sulfide, which is essentially insoluble and is unlikely to leach. Therefore, little or no adverse impact would be expected from management of the mercury-bearing activated carbon sorbent.

Periodic cleaning of the HRSG would result in generation of chemical cleaning wastes consisting of alkaline and acidic solutions containing high concentrations of heavy metals. The independent contractors conducting the cleaning operations would remove these wastes for neutralization, metals recovery, other treatment, and disposal of the residues at offsite locations. The volume of these wastes has not been quantified. Management in accordance with applicable regulations should minimize adverse impacts.

Used gasification-process catalysts ***and spent catalysts from removal of carbon monoxide*** would be regenerated and reused to the extent possible, thus avoiding most potential adverse impacts from their management. ***When regeneration of a spent catalyst is no longer feasible, the material would be recycled in an offsite commercial facility or managed as hazardous or solid waste.*** The used activated carbon sorbent from sour water treatment (volume estimated at 1500 yd^3 per year) would be tested to determine whether it requires management as RCRA hazardous waste. If determined to be nonhazardous, it would be taken for disposal in a municipal landfill; if determined to be hazardous, it would be transported off the site by a hazardous waste contractor for appropriate processing and disposal. Waste volume would be small in comparison to facility capacity, and management in accordance with applicable regulations should minimize adverse impacts.

Because operation of the proposed facilities would increase the Stanton Energy Center's requirements for water, quantities of brine, demineralizer resins, and other residues generated from treatment of intake water and recycling of facility wastewater would also increase, approximately in proportion to the increase in water use. Waste characteristics would not change, and the increased waste volumes could be accommodated in the onsite and offsite landfills where these types of wastes are currently managed (Section 3.8).

Operation of the proposed facilities would also increase the Stanton Energy Center's generation of other wastes typical of power generation operations. Used oils collected from the oil/water separator, spent lubricating oils, and used oil filters would be transported off the site by an outside contractor for recycling or disposal. Office wastes; air inlet filters; maintenance-related wastes such as rags, broken or rusted metal and machine parts, and defective or broken electrical materials; empty containers; and other miscellaneous solid wastes would be removed for disposal in an offsite, licensed landfill such as the Orange County Sanitary Landfill, which would have sufficient space to accommodate the waste. The facility operators would attempt to minimize hazardous waste generation by using nonhazardous solvents, paints, and other maintenance chemicals. The minor quantities of hazardous wastes generated in spite of these efforts would be managed through a commercial contractor in accordance with applicable federal and state requirements. Management of nonhazardous and hazardous maintenance wastes in accordance with applicable regulations and license conditions should prevent adverse impacts.

4.1.9 Human Health and Safety

4.1.9.1 Air Quality and Public Health

Criteria Pollutants

Proposed facility operations would slightly increase air pollutant concentrations (Table 4.1.1), with SO_2, NO_x, and particulate matter being the primary pollutants of particular concern. The greatest exposures to predicted concentrations of primary air pollutants would be experienced by residents of Orange County (2004 population of 1,021,215, including 219,568 children less than 15 years old and 99,131 elderly at least 65 years old); however, apportionment of the exposures (based on maximum predicted ambient air pollutant concentrations due to emissions from the proposed facilities in Table 4.1.1) would not be uniform across the county (exposure to a pollutant is defined as a person's contact with a pollutant of a given concentration over a given time period). The assignment of maximum predicted ambient air pollutant concentrations (Table 4.1.1) which are predicted to occur at or near the northern site boundary, to all members of the county regardless of distance and direction from the proposed facilities would result in values in Tables 4.1.9, 4.1.10, and 4.1.11 that overpredict the health effects. Because most of the concentrations of secondary pollutants (e.g., O_3, sulfates, nitrates) resulting from precursors emitted by the proposed facilities would be formed outside of Orange County, their formation is assumed to not appreciably impact county residents (Rabl et al. 1999). In particular, the small percentage increases in precursor NO_x and VOC emissions would not be likely to degrade O_3 concentrations sufficiently to cause violations in the O_3 NAAQS, but the magnitude of the degradation cannot be quantified (Section 4.1.2.2).

This impact assessment is based on epidemiological studies of public health effects of air pollutants. In general, these studies do not consider personal exposures, but examine health effects among populations in relation to ambient concentrations of pollutants. Exposure-response functions (ERFs) are developed from these associations. Because studies defining ERFs specifically for Orange County are not available, the ERFs used to estimate health impacts of pollutant increases are derived from studies of populations and air pollution sources from a variety of geographic regions, primarily in North America and Europe. This assessment recognizes that varying population demographics, pollution composition, and climates may affect statistical relationships. However, two of the largest studies to date — the National Morbidity, Mortality, and Air Pollution Study (NMMAPS) in the United States (HEI 2004) and Air Pollution and Health: A European Approach (APHEA2) in Europe

Table 4.1.9. Estimates of annual mortality due to average annual increase in selected air pollutants[a]

Pollutant	Exposure-response functions expressed as relative risk (95% confidence interval)	Estimated additional Orange County deaths per year		
		low	mean	high
PM-10 ($\mu g/m^3$)				
All-cause [b]	1.02 (1.015-1.024)	1.2	1.6	1.9
Respiratory [c]	1.013 (1.005-1.02)	0.06	0.16	0.24
Cardiovascular[c]	1.009 (1.005-1.013)	0.33	0.59	0.86
CO (ppm)[b,d]	1.017 (1.012-1.022)	0.13	0.19	0.24
SO_2 (ppb)[c]	1.009 (1.007-1.012)	0.19	0.23	0.31
NO_2 (ppb)[e]	1.028 (1.021-1.035)	-	-	-

[a]Population at risk is from birth to death, except for the two rows dealing with respiratory and cardiovascular deaths, which are based on populations aged 65+.

[b]Stieb, et al. 2002. Meta-analysis of time-series studies of air pollution and mortality, J. Air & Waste Manage. Assoc. 52:470-84.

[c]Anderson et al. 2004. Meta-analysis of time series studies and panel studies of particulate matter (PM) and ozone (O_3). Report of a World Health Organization task group. Copenhagen, Regional Office for Europe.

[d]Because no National Ambient Air Quality Standard exists for annual-average CO, no air dispersion modeling was performed for this CO averaging period (Table 4.1.1). Consequently, the annual-average CO value for the proposed facilities was estimated by dividing the 1-hour CO value of 13.7 ug/m^3 (Table 4.1.1) by 1,150 to obtain the equivalent in units of ppm, and then multiplying by 0.08 to convert from a 1-hour prediction to an annual-average prediction of 0.001 ppm. The factor of 0.08 has been recognized as providing a conservative estimate (forming an upper bound) of the actual annual-average concentration (EPA 1992).

[e]Samoli et al. 2003 (Occup Environ Med 2003; 60: 977-82) reports that there is little risk of increased mortality due to NO_2 until the concentration exceeds about 80 ug/m^3.

(Katsouyanni 2001) — have produced remarkably consistent results (American Heart Association 2004). Consequently, this assessment assumes the selected ERFs represent reasonable values applicable to the Orlando area population, pollution composition, and climate sufficient for judging potential impacts.

Mortality. There is a considerable body of evidence associating daily mortality with air pollution. Estimates of increased daily mortality due to the daily increase in criteria air pollutants predicted to be added by the addition of the proposed facilities are annualized and presented in Table 4.1.9. The ERFs are pooled relative risks selected from a meta-analysis of 94 studies. The uncertainties indicated by the confidence intervals reflect only the statistical uncertainties from the studies themselves. Modeled exposure values, selected populations, and underlying disease/death rates, in so much as the selected values depart from the actual conditions, may widen uncertainty on either side of the estimate. Apportionment of the exposures uniformly to all county residents

Table 4.1.10. Lifetime years of lost life (YLL) and days of lost life (DLL) from an average annual increase in PM-2.5 concentration of 0.24 μg/m^3

Age range	Population	Lifetime YLL per 1,000 persons	Lifetime DLL per person
<1	15,210	3.9	1.5
1-4	55,159	0.7	0.27
5-9	71,593	0.3	0.13
10-14	77,555	0.5	0.20
15-19	76,065	1.3	0.47
20-24	77,017	2.3	0.87
25-34	159,254	4.7	1.7
35-44	165,198	7.6	2.8
45-54	138,377	12.3	4.5
55-64	86,656	12.7	4.7
65-74	51,788	11.5	4.2
75-84	34,691	11.4	4.1
85+	12,652	6.3	2.3

Table 4.1.11. Estimates of increases in annual morbidity effects due to estimated annual increase in particulate matter

Outcome	Pollutant	Estimated annual increase in number of cases		
		Low[a]	Mean	High[a]
Respiratory hospital admissions, age 65+	PM-10	7	33	59
Incidence of adult bronchitis, age 19-65	PM-2.5[b]	0[c]	7	15
Asthma hospital admissions, age < 65	PM-2.5	0.7	3	6
Asthma emergency room visits, age < 65	PM-10	1.3	4	7
Asthma attacks among asthmatics	PM-10	73	307	540
Work loss days, age 19-65	PM-2.5	1,380	1,633	1,887
Adult minor restricted activity days, age 19-65	PM-2.5	7,080	8,693	10,300

[a]Low and high represent the lower and upper bounds of the 95% confidence interval for the mean.

[b]Average annual increase in PM-2.5 is estimated as 0.24 μg/m^3, based on 60% of the PM-10 value of 0.4 μg/m$^{3.}$

[c]A low value of zero means that the "no observed increase in effect" falls within the 95% confidence interval and the mean and high values are not statistically significant.

Source: The Particulate-Related Health Benefits of Reducing Power Plant Emissions, October 2000, Prepared for the Clean Air Task Force by Abt Associates Inc. 4800 Montgomery Lane, Bethesda, MD 20814.

overestimates the health effects. For persons exposed to the maximum predicted increase in annual PM-10 concentration of 0.4 $\mu g/m^3$ at or near the northern site boundary (Table 4.1.1), there is an expected all-cause increase in mortality of about 1.6 deaths per year (Table 4.1.9). Mortality increases associated with other criteria pollutants are smaller (Table 4.1.9). The low, mean, and high values are determined from the statistical uncertainty associated with the estimates of the ERFs alone. The table values likely overestimate the actual effects by a factor of 2 to 5 due to wide uncertainty about individual exposures.

Based on the predicted 0.4 $\mu g/m^3$ increase in annual-average PM-10 concentration (Table 4.1.1) and assuming that the concentration of fine particulate matter (PM-2.5) would be 60% of the PM-10 concentration (Rabl 1998), the predicted annual average PM-2.5 concentration would be 0.24 $\mu g/m^3$. Using the World Health Organization years of lost life (YLL) calculator and the all-cause Orange County annual mortality rate, the expected days of lost life (DLL) over a person's remaining life at the increased exposure is less than 5 days per person at any age (Table 4.1.10).

Morbidity. Significant associations between primary air pollutants and hospital admission for a number of health effects including respiratory and cardiovascular diseases have been reported by many organizations and in numerous health effects studies. In one study by Wong et al. (1999), it was reported that persons aged 65+ made up 68% and 38% of admissions for cardiovascular and respiratory diseases, respectively. Manifest health injuries, such as new cases of disease and hospital admissions from disease exacerbation, appear to be much less impacted than quality-of-life effects such as restricted activity and lost work days (Table 4.1.11). The increase in the incidence of adult bronchitis presented in Table 4.1.11 is not statistically significant.

Sulfur dioxide is statistically associated with all-cause hospitalizations, and hospitalizations for respiratory disease, asthma, and cardiovascular disease (Wong et al. 1999). Mortality attributed to sulfur dioxide has a larger relative risk than does hospitalization associated with SO_2 exposure (relative risk 1.013 per 10 $\mu g/m^3$ increase in SO_2 reported by Wong et al. (1999). Therefore, the potential SO_2 impacts related to hospitalization should also be less. For example, the total increase in hospitalizations resulting from an increase in SO_2 of 0.1 $\mu g/m^3$ (Table 4.1.1) is much less than one additional hospitalization per year. The other health effects categories having lower relative risks are assumed to have little or no impact as well. Linn et al. (1997) reported that the short-term SO_2 threshold of response in asthmatics is approximately 435 $\mu g/m^3$, which is much higher than the maximum 3-hour total SO_2 impact of 113 $\mu g/m^3$, for the combined proposed facilities and existing sources (Table 4.1.2).

Nitrogen dioxide is statistically associated with total mortality. However there appears to be little if any excess risk until the NO_2 concentration exceeds about 80 $\mu g/m^3$. Even without considering the offsets in emissions from Units 1 and/or Unit 2, the small projected increase of 0.6 $\mu g/m^3$ (Table 4.1.1) would not be considered sufficient to produce measurable health impacts (Samoli et al. 2003), and the maximum annual total NO_2 impact of 24 $\mu g/m^3$, for the combined proposed facilities and existing sources (Table 4.1.2) is much less than the threshold of 80 $\mu g/m^3$.

Evidence exists for a correlation between exposure to CO and mortality due to congestive heart failure among the elderly (Schwartz 1995). Table 4.1.9 suggests that the anticipated impacts are small. In much higher concentrations than the predicted incremental increase (Table 4.1.1) and total impacts (Table 4.1.2), carbon monoxide can reduce exercise tolerance, produce chest pain in heart patients, cause headaches, and contribute to death from anoxia.

Hazardous Air Pollutants

EPA (1998) reported that the vast majority of coal-fired power plants were estimated to pose lifetime human cancer risks (i.e., increased probability of an exposed person getting cancer during their lifetime) of less than 1×10^{-6} resulting from inhalation exposure to emissions of hazardous air pollutants. As an upper bound of risks, the increased lifetime cancer maximum individual risk (MIR) within a 31-mile radius of a coal-fired power plant is estimated to be no greater than 3×10^{-6} due to inhalation exposure to all carcinogenic hazardous air pollutants. Arsenic and chromium are the hazardous air pollutants contributing the most to the risk (2×10^{-6} and 1×10^{-6}, respectively). All other hazardous air pollutants, including radionuclides, were estimated to present an inhalation risk of less than 1×10^{-6}. The cancer incidence in the United States due to inhalation exposure to hazardous air pollutants (including radionuclides) from all 426 coal-fired plants is estimated to be no greater than approximately 0.2 cancer cases per year, or 1 case every 5 years. The proposed facilities are expected to pose less risk than most of these existing plants, many of which were built decades ago.

The EPA also assessed noncancer risks (i.e., health effects other than cancer) due to short- and long-term inhalation exposure. Manganese, hydrogen chloride, hydrogen fluoride, and acrolein were found to be the four hazardous air pollutants of highest potential concern for noncancer effects. The measure of effect used to evaluate risk was the reference concentration — an estimate, with uncertainty spanning about an order of magnitude, of the daily inhalation exposure of human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime. Based on modeling hazardous air pollutants with the human exposure model (HEM), estimated long-term ambient hazardous air pollutant concentrations were generally 100 to 10,000 times below the reference concentration or similar benchmark. The highest estimated long-term ambient hazardous air pollutant concentration was 10 times below the reference concentration.

In addition to these EPA studies of coal-fired plants in general, a health risk analysis for specific hazardous air pollutants using ambient concentrations from AERMOD results for the proposed facilities was conducted as part of the Site Certification Application (OUC, 2006). The compounds included in the analysis were presented earlier in Table 2.1.3. A summary of the results is provided in Table D.15 of Appendix D. ***For acute health effects, the predicted concentrations of all hazardous air pollutants would be below the threshold concentration. For chronic effects, t***he total cancer risk for all hazardous air pollutants included in the analysis was 4.1×10^{-7}, with chromium being the largest contributor to the total risk, which is almost a factor of ten lower than the upper bound of risk predicted in the EPA study. The total noncancer risk was calculated as 4.8×10^{-3}, which is in the range of that predicted by the EPA study.

The EPA believes that mercury from coal-fired power plants is the hazardous air pollutant of greatest potential concern, but uncertainty exists regarding the extent of risk, particularly with regard to deposition downwind of emissions sources (Section 4.1.2.2). Modeling results (Section 4.1.2.2) indicate that mercury emissions from the proposed facilities would pose no direct threat to human health in the area because the maximum ambient concentrations of mercury from the proposed HRSG stack are predicted to be 0.8% of their corresponding guideline value and 0.003% of their reference concentration. However, most of the mercury in the air is elemental mercury vapor, which circulates in the atmosphere for up to a year, and hence can be widely dispersed and transported thousands of miles from emission sources. As mercury cycles between the atmosphere, land, and water, it undergoes a series of complex chemical and physical transformations, many of which are not completely understood. Mercury is a persistent element and bioaccumulates most efficiently in the aquatic food web, predominantly as methylmercury. Given the current scientific understanding of the environmental fate and transport of this element, it is not possible to quantify how much of the methylmercury in fish consumed by the U.S. population is contributed by U.S. emissions relative to other sources of mercury (e.g., natural sources and re-emissions from global sources). As a result, it cannot be assumed that a change in total mercury emissions would result in a linear change in methylmercury in fish, and it cannot be estimated over what time period these changes would occur.

4.1.9.2 Hazardous Material Releases, Fires, and Explosions

During construction, flammable liquids and compressed gases would be stored and used. Liquids would include construction equipment fuels, paints, and cleaning solvents. Compressed gases would include acetylene, oxygen, helium, hydrogen, and argon for welding. Other hazardous material used during construction would include various cleaners, sealants, lubricants, paints, and thinners. Chemicals for cleaning the HRSG and process piping would also be used. The risk of a major release, fire, or explosion during construction of the proposed facilities with potential offsite impact is not credible due to the small quantities and remote locations from public areas.

Natural gas would be available for facility startup and would be fired in the gas combustion turbine and duct burners during periods when the gasifier was not operating. Natural gas would be supplied by the existing onsite pipeline that serves Unit A. Health risk impacts would not change.

Two “highly hazardous chemicals” are currently used at the Stanton Energy Center in quantities that have potential offsite impact: chlorine gas used for water treatment, and ammonia used for removal of oxides of nitrogen. Because of the quantities available, the power plant is subject to EPA’s Accidental Release Prevention Program (ARPP) regulations (40 CFR Part 68), OSHA’s Process Safety Management (PSM) regulations (29 CFR 1910.119), and the Florida Accidental Release Prevention and Risk Management Planning Act, Chapter 252 of the Florida statutes. These regulations require a quality control program to ensure that all equipment used in the system is designed according to industry standards; development of operating procedures; worker training; process hazard analysis (PHA) and risk management plan (RMP) to identify potential scenarios for accidental releases from the system; and mitigation of potential releases identified in the PHA.

Existing regulatory requirements would be expanded to include the new applications and quantities. The health risk impact for each of these chemicals would increase due to the larger quantities being handled, but the increased risk would remain exceedingly small. For example, if the probability of a vessel failure resulting in a fire or explosion is taken as 1 occurrence per 100,000 years (based on expected engineering failure rates rather than statistical data) (ConocoPhillips 2003), the addition of a second vessel would nearly double this probability to 1.99 occurrences per 100,000 years. The RMP for onsite storage (EPA 1000 0018 2713) involved one 18,000-gal anhydrous ammonia tank located near the proposed gasification island. Based on air dispersion modeling in the RMP, an ammonia release from the site could travel slightly over 2 miles and potentially involve 2,300 people (worst-case release resulting in total loss of contents over 10 minutes). The possibility of ground or surface water contamination is not considered a credible event because the release would be in the form of a gas rather than a liquid.

Ammonia gas can be released in small quantities (referred to as ammonia slip) from use in the selective catalytic reduction process for control of nitrogen oxide emissions. Ammonia slip associated with the proposed facilities would not exceed 10 ppm at the point of release. Downwind exposures to the public would be much lower. Twenty-five ppm is considered the lowest short-term concentration known to produce transitory eye and respiratory tract irritation. Therefore, no public health impact is expected to result from ammonia slip.

Excess ammonia not utilized by the process would be recovered and shipped to offsite customers. Currently, once per week, a truck of ammonia is brought on the site to supply the selective catalytic reduction systems of the existing Units 2 and A (Section 2.1.1). Ammonia generated by the proposed facilities would replace this delivery, but 6 trucks per week would transport ammonia off the site, thus increasing the hazard of anhydrous ammonia transport. The median probability rate of a tank truck accident with a large release is reported as 1.8×10^{-6} per mile (Center for Chemical Process Safety 1995). The most common type of road trailer used by tank trucks to transport anhydrous ammonia has a capacity of 11,500 gal (http://www.mda.state.mn.us/spills/ammonia/transportation.htm); however, a non-insulated cargo tank is not allowed to be filled beyond 82% of capacity (Table E.1). Assuming shipments are made by tank truck to an anhydrous ammonia supplier in Jacksonville, a trip of 143 miles, the estimated probability of a large release is approximately equal to 1 accident per 12.5 years, based on 6 trips per week during 52 weeks of the year for a total of 312 truck trips per year.

As a backup, when ammonia could not be transported off the site (e.g., during a strong hurricane), the ammonia could be recycled back to the gasifier for destruction, which has been shown by KBR to be an effective technique to break down ammonia into nitrogen and hydrogen. Similar experience in recycling ammonia back to the gasifier for destruction has been gained by British Lurgi. If all of the ammonia produced in the proposed gasifier were recycled, an ammonia tank truck would be needed every three weeks from outside the Stanton Energy Center to supply the selective catalytic reduction system of the proposed facilities. This would be in addition to the one truck of ammonia needed every week for the selective catalytic reduction systems of the existing units. So during the periods when all the ammonia is recycled back to the gasifier for destruction, a total of 1 1/3 trucks per week would be brought on the site to supply the selective catalytic reduction systems, but the 6 trucks per week transporting ammonia off the site would be discontinued.

Large releases from rail accidents are less likely than those from truck transport. ***If*** anhydrous ammonia ***is*** transported in a rail car with a capacity of 33,500 gallons (http://www.mda.state.mn.us/spills/ammonia/transportation.htm), less trips to Jacksonville would be required compared to tank trucks. The probability of a large release from a rail accident similar to the above-calculated probability of a truck accident is about 1 accident per 780 years, based on (1) the same 143-mile trip, (2) current railroad accident rates of 3,979 cars derailed per 1,000,000,000 railcar-miles traveled, and (3) a 2.5% probability of a release resulting from a derailed car (assuming Class I track, excluding railyard operations) (Anderson and Barkan 2004). The calculated probability of an accident also assumed that 3 ammonia rail cars would be included on each of 30 trains required per year to transport the same volume of anhydrous ammonia as the 260 truck trips per year to Jacksonville.

The ALOHA air dispersion model (NOAA 2006) was used to estimate airborne concentrations of ammonia downwind of a 19-ton instantaneous release following a truck accident (selected because a truck accident would be more likely). As an historical precedent, a tank truck instantaneously released about 19 tons of ammonia in an accident near Houston, Texas, on May 11, 1976 (Appendix E). As a conservative (upper-bound) assumption, the average population density of Orange County was applied along the entire length of a hypothetical truck shipment of the same release amount from the Stanton Energy Center to Jacksonville. Appendix E provides the assumptions and various inputs, as well as a graphical representation of the toxic threat zone from which the potential impacts were estimated.

The estimated toxic impacts for ammonia predicted by ALOHA (Appendix E) are based on the American Industrial Hygiene Association's Emergency Response Planning Guide (ERPG) values. Approximately 655 people are predicted by ALOHA to be in the ERPG-3 zone (with ammonia concentrations of at least 750 ppm), which is the area in which a 1-hour exposure would be expected to produce life-threatening health effects. About 1,091 people are predicted to be in the ERPG-2 zone (with ammonia concentrations of at least 150 ppm but less than 750 ppm), which is the area in which a 1-hour exposure would be expected to produce irreversible or other serious health effects or symptoms that might limit their ability to take protective action. Approximately 4,146 people are predicted to be in the ERPG-1 zone (with ammonia concentrations of at least 25 ppm but less than 150 ppm), which is the area in which a 1-hour exposure would be expected to produce mild, transient health effects or a perception of a clearly defined, objectionable odor. Altogether, about 13,000 people would require sheltering in place or evacuation to preclude exposures at the level of ERPG-1 or higher (see confidence lines in Figure E.1) resulting from such a truck accident.

The ALOHA model was also used to calculate a flammable threat zone and overpressure (blast force) threat zone for the same 19-ton instantaneous release of ammonia following a truck accident but, because the consequences were much less than the consequences for the toxic threat zone, those results are not presented in this document.

4.1.9.3 Electromagnetic Fields

The transmission line needed to support the proposed facilities would be an onsite interconnection of the proposed combined-cycle facilities to the existing substation located approximately 3,000 ft to the northeast. The proposed facilities would add 285 MW (18%) of generating capacity to the existing production of approximately 1,569 MW at the Stanton Energy Center.

The Florida Department of Environmental Protection regulates electromagnetic fields (EMF) from electrical transmission lines and substations. For the proposed facilities, compliance with Chapter 62-814 would limit the electric field strength at the edge of the transmission right-of-way or substation property boundary to 2 kV/m and would limit the magnetic field strength to 150 milliGauss (Section 3.9.2.3). The 2003 annual report on EMF research from the Florida Department of Environmental Protection (Section 3.9.2.3) indicated that existing health effects data provided no conclusive scientific evidence justifying making these limits more stringent.

Because no new transmission line would be built off the site, EMF-related health effects, if any, would continue unchanged and small.

4.1.9.4 Worker Health and Safety

Potential health impacts to workers during construction of the proposed facilities would be limited to the normal hazards associated with construction (i.e., no unusual situations would be anticipated that would make the proposed construction activities more hazardous than normal for a major industrial construction project). Most accidents in the construction industry result from overexertion, falls, or being struck by equipment (NSC 2004). Construction-related illnesses would also be possible (e.g., exposure to chemical substances from spills).

The Bureau of Labor Statistics recorded 93 construction-related fatalities in Florida during 2003 (Table 3.9.3). Based on Florida statewide statistics (Table 3.9.2, Table 3.9.3, and http://www.bls.gov/iif/oshwc/osh/os/pr036fl.pdf) applied to an average of 350 workers on the site, the proposed project could expect 0.17 fatalities and 61 nonfatal injuries and illnesses during the 28-month period of construction. During operations for the 4.5-year period ending August 2005, the Stanton Energy Center had 11 injuries resulting in lost time constituting an incidence rate of 1.2 per 100 full-time employees per year. This rate is much lower than the corresponding incidence rate of 4.0 for utilities statewide in 2003 (Table 3.9.2). During the same 4.5-year period, the Stanton Energy Center had no fatalities, while 4 utility-related fatalities were recorded in Florida during 2003 (Table 3.9.3). Based on the Stanton Energy Center statistics and 72 additional full-time employees for the 4.5-year demonstration period, the proposed facilities could expect no fatalities and about 4 lost-time injuries.

The proposed facilities would be subject to the OSHA General Industry Standards (29 CFR Part 1910) and the OSHA Construction Industry Standards (29 CFR Part 1926). During construction and operation of the proposed facilities, risks would be minimized by the proposed facilities' adherence to procedures and policies required by OSHA. These standards establish practices, chemical and physical exposure limits, and equipment specifications to preserve employee health and safety. Construction permits and safety inspections would be employed to minimize the frequency of accidents and further ensure worker safety. Construction equipment would be required to meet all applicable safety design and inspection requirements, and personal protective equipment would be used when needed to meet regulatory and consensus standards.

To maximize worker safety, operations would be managed from a control room. All instruments and controls would be designed to ensure safe start-up, operation, and shut down. The control system would also monitor operating parameters and perform reporting functions. Control stations would be placed at remote locations at which operator attention would be required. Therefore, the overall design, layout, and operation of the facilities would minimize human hazards. Compliance with the Federal Occupational Safety and Health Standards, as well as safety standards carried over from the existing operations would help maintain occupational safety.

The proposed facilities would develop supplemental detailed procedures for inclusion in their Occupational Safety and Health Program to assure compliance with OSHA and EPA regulations and serve as a guide for providing a safe and healthy environment for employees, contractors, visitors, and the community. These procedures would include job procedures describing proper and safe manners of working within the facilities (e.g., handling and storage of ammonia would comply with 29 CFR 1910.111), appropriate personal protective equipment (complying with 29 CFR 1910.132), and appropriate hearing conservation protection devices. The manual would be used as a reference and training source and would include accident reporting and investigation procedures, emergency response procedures, toxic gas rescue-plan procedures, hazard communication program provisions, material safety data sheet accessibility, medical program requirements, and initial and refresher training requirements. In addition, supplemental provisions would be added to the proposed facilities' Emergency Action Plan, Risk Management Plan, and Process Safety Management Plan.

4.1.9.5 Intentional Destructive Acts

Although concerns have been raised about the vulnerability of nuclear power plants to terrorist attack (Behrens and Holt, 2005), the potential for such attacks on coal-based power plants has not been identified as a threat of comparable magnitude. However, there is the potential for release of hazardous materials in the event of an intentional destructive act. The potential consequences of a hazardous materials release, whether resulting from accidental causes or an intentional destructive act, are discussed in Section 4.1.9.2 above.

An intentional destructive act could also result in a disruption of power supply to the electrical grid. However, the Orlando Gasification Project would be the smallest generating unit at the Stanton Energy Center. Temporary loss of this unit would not be expected to have a substantial effect on regional power supply. Security currently in place to protect the existing units at the Stanton Energy Center from such acts would be expected to be sufficient to also protect the Orlando Gasification Project facilities.

4.1.10 Noise

Anticipated construction and operational noise levels from the proposed facilities would not present a potential for noise-induced hearing loss to the public. From the northern edge of the proposed principal site, the nearest property boundary is approximately 3,000 ft to the north and the nearest residence is about 6,500 ft to the northeast.

4.1.10.1 Construction

During construction of the proposed facilities, noise would be generated by construction equipment including bulldozers, trucks, backhoes, graders, scrapers, compactors, cranes, pumps, pneumatic tools, air compressors, and front-end loaders. Noise levels during construction, which would be typical of industrial plant construction, would increase from current operational levels at the Stanton Energy Center. Table 4.1.12 displays predicted sound levels at three distances from the loudest noise sources during construction activities, including steam blowdown required toward the end of the construction phase. As calculated in Table 4.1.12, sound propagating in air from a point source decreases by 6 dBA for each doubling of distance from the noise source.

With the exception of pile drivers and steam blowdown, noise generated by dump trucks (Table 4.1.12) would be similar in sound level to much of the noise generated by loud construction equipment (e.g., bulldozers, pneumatic tools). Noise generated by dump trucks would attenuate to a level of about 55 dBA at the nearest property boundary and 49 dBA at the nearest residence. These levels are less than existing ambient noise levels measured at many nearby locations (Table 3.10.2). The construction noise would likely not be distinguishable from existing noise at the gate to the Stanton Energy Center at Alafaya Trail, the nearest point of public access. For comparison, the Orange County noise limit is 60 dBA from 7 a.m. until 10 p.m. and 55 dBA from 10 p.m. until 7 a.m. for residential areas (Section 3.10.2). No adverse community reaction would be anticipated as a consequence of noise levels below 50 dBA (EPA 1974), as predicted for the nearest residence.

Steam blowdown is a procedure using pressurized steam to clear specific equipment of debris. For the HRSG and steam turbine, the activity would consist of five blows over a period of six days lasting approximately 18 to 24 hours each. For the gasifier steam lines, four additional blows of about 18 to 24 hours each over a 5-day period would be required. For all of these steam blows, the peak sound pressure level at a distance of 50 ft from the source would be approximately 102 dBA (Table 4.1.12). The noise would attenuate to a level of about 66 dBA at the nearest property boundary and 60 dBA at the nearest residence. A level of 60 dBA would be typical of normal conversation (Table 3.10.1). The estimated noise levels conservatively (i.e., as an upper bound) do not account for any additional sound attenuation that might result from structures or vegetation. The predicted noise levels apply to receptors outdoors; persons indoors would experience a reduced level of noise.

Noise from construction-related truck traffic on Alafaya Trail passing nearby residential areas would be similar to existing levels measured at Location 4, the residential location (Table 3.10.2). Noise during the daytime at Location 4 ranged from 44.6 to 94.1 dBA, with an L_{eq} of 73.3 dBA. Assuming that the measurements were taken 35 ft from Alafaya Trail, the peak sound level of

Table 4.1.12. Sound levels from loudest noise sources during construction activities

Noise source	Sound pressure level at 50 ft (dBA)[a]	Sound pressure level at nearest site boundary (3,000 ft to the north) (dBA)[b]	Sound pressure level at nearest residence (6,500 ft to the northeast) (dBA)[b]
Dump truck	91	55.4	48.7
Pile driver[c]	101	65.4	58.7
Steam blowdown	102	66.4	59.7

[a]*Source (for this column):* EPA (U.S. Environmental Protection Agency) 1971. Community Noise. Prepared by Wyle Laboratories under contract 68-04-0046 for the Office of Noise Abatement and Control, Washington, D.C., December.

[b]Calculations in the two righthand columns are based on starting with the sound pressure levels at 50 ft provided by the EPA 1971 source, and then assuming that sound propagation in air from a point source decreases by 6 dBA for each doubling of distance from the noise source. Not adjusted for additional sound attenuation from structures and vegetation.

[c]Pile driving may not be required.

94.1 dBA would decrease to 91 dBA at 50 ft, which is the same level indicated for a dump truck at 50 ft in Table 4.1.12. Adjusting for a distance of 250 ft from Alafaya Trail to the nearest residence, the peak 94.1 dBA at 35 ft would decrease to 77 dBA at the nearest residence. Similarly, the L_{eq} would decrease to 56 dBA. For comparison, 55 dBA is the approximate level of a quiet subdivision during daylight hours. This level is also given by the EPA as a guideline upper limit with an adequate margin of safety for protection from activity interference and annoyance during the daytime in outdoor locations "in which quiet is a basis for use" (EPA 1974). Motor vehicles operating on a public right-of-way are exempt from the Orange County noise ordinance.

Noise levels from current rail traffic have not caused any public complaints. Increased rail traffic due to the proposed project (two to three additional coal deliveries per week compared to five deliveries per week currently) would result in more frequent noise from rail traffic, but the noise levels would be the same.

4.1.10.2 Operation

During operation of the proposed facilities, the principal sound sources would include equipment such as the gas combustion turbine/generator, steam turbine/generator, heat recovery systems, turbine air inlets, exhaust stack, 6-cell mechanical-draft cooling tower, coal crusher, coal mill, pumps (e.g., feed, circulating), fans, and compressors, as well as noise from piping flow and flared gas. Most of these sound sources would be enclosed and acoustically insulated. Noise sources within buildings would be fitted with sound-attenuating enclosures or other noise dampening measures that would meet all state and federal regulations. During maintenance or repair events, workers would be required to wear hearing protection equipment.

Estimates of noise characteristics for key operating equipment currently are not available, with the exception of vendor noise data for the ammonia facility's air compressor. For other facility components, near-field A-weighted noise levels were developed based on measurements around corresponding components at the Power Systems Development Facility near Wilsonville, Alabama (Section 1.4). A model was developed using SoundPLAN software to predict sound levels at varying distances from the proposed facilities. The receiver locations were assumed to be 5 ft above the ground, and the terrain was assumed to be flat.

The frequency content of noise is needed to accurately predict noise propagation with distance. Because no frequency content was available for the near-field levels developed from measurements, the frequency content was estimated using the Edison Electric Institute's Power Plant Environmental Noise Guide, which estimates sound power levels at various octave-band frequencies for common power plant equipment. Based on the relative frequency components in the guide, the octave-band levels for the equipment were adjusted until the expected dBA level at a distance of 4 ft matched the levels measured at the Power Systems Development Facility. Worst-case levels were used for sources with levels that varied with time.

During operation of the proposed facilities, a noise level of 53.2 dBA was predicted by the model at a location about 3,000 ft to the northeast of the proposed facilities (the receiver location nearest to the nearest residence). Sound propagating in air from a point source decreases by 6 dBA for each doubling of distance from the noise source. Therefore, the predicted noise level at the nearest residence (about 6,500 ft to the northeast of the proposed facilities) would be 46.5 dBA. For comparison, the Orange County noise limit is 60 dBA from 7 a.m. until 10 p.m. and 55 dBA from 10 p.m. until 7 a.m. for residential areas (Section 3.10.2). A design engineer would determine the need for noise control on any equipment such that the cumulative Stanton Energy Center noise level would achieve the design objective of an L_{dn} in compliance with the Orange County noise ordinance. No adverse community reaction would be expected as a result of noise levels below 50 dBA (EPA 1974).

Because operational steam blowdown would be similar to blowdown during the end of the construction phase, potential impacts should be the same as predicted in Section 4.1.10.1.

4.2 POLLUTION PREVENTION AND MITIGATION MEASURES

Pollution prevention and mitigation measures have been incorporated by Southern Company and OUC as part of the design of the proposed project. The proposed project would minimize SO_2, NO_x, mercury, and particulate emissions by removing constituents from the synthesis gas. The removal of approximately 80% of the fuel-bound nitrogen from the synthesis gas prior to combustion in the gas turbine would result in appreciably lower NO_x emissions compared to ***existing,*** conventional coal-fired power plants. The project is expected to remove up to 95% of the sulfur and over 90% of the mercury. Over 99.9% of particulate emissions would be removed using high-temperature, high-pressure filtration (rigid, barrier-type filter elements). Approximately 25% less CO_2 would be produced per unit of power generated compared to typical emission rates at ***existing,*** conventional coal-fired power plants. However, there would be a net increase in global emissions of CO_2.

Options for mitigation of CO_2 emissions generally include capture and sequestration. For this project, mitigation is not feasible since the sulfur removal technology being used does not generate a concentrated CO_2 stream. ***However, even if the facilities were to generate a concentrated CO_2 stream, the nearest location amenable to CO_2 sequestration options that have been demonstrated at the scale needed (i.e. enhanced oil recovery) would be hundreds of miles away.*** The feasibility and effectiveness of other sequestration options, such as injection into saline formations, are not promising for this area and have not been fully characterized. Sequestration options for all regions of the country are still under investigation in DOE's Carbon Sequestration Program (DOE 2006). A program goal is to initiate at least one large-scale demonstration, at the scale required for a power plant, in 2009 to demonstrate the appropriateness for CO_2 injectivity and validate storage capacity estimates and permanence.

In the long term, the feasibility of carbon sequestration for the proposed facilities would depend upon the implementation of CO_2 emissions regulations and further characterization of the geologic formations in the Orlando area. It is generally recognized that carbon sequestration is unlikely to be deployed in situations other than value added applications (e.g. enhanced oil recovery) in the absence of regulations (IPCC 2005). If such regulations were enacted, it is likely that there would be more incentive to characterize the sequestration potential of geologic formations in the central Florida region. The only characterization of sequestration potential that includes the Orlando area was at a "reconnaissance level" and was completed about six years ago. However, a geologic formation has been identified (the Cedar Keys/Lawson) and this formation could be further characterized. (http://www.beg.utexas.edu/environqlty/co2seq/0cedarkey.htm) In the event that such further characterization revealed suitable sequestration potential, the proposed IGCC facilities might be retrofitted with carbon capture equipment and the carbon sequestered in a geologic formation at some time in the future.

The proposed project would discharge no liquid effluent from the site. Ash generated by the gasifier would be combusted in the existing coal-fired units, marketed for use as activated carbon, or trucked to the existing onsite landfill for permitted disposal. Anhydrous ammonia and sulfur byproducts would be recovered and marketed.

As a condition of the state of Florida's certification of the proposed facilities, Southern Company and OUC are required to develop a program for mitigating traffic impacts. DOE would also consider adopting a condition of the use of rail transport to the maximum extent practicable as a mitigation measure in the Record of Decision.

For mitigation of the wetland area impacted by the construction of the transmission line, OUC would purchase credits at a local mitigation bank. The total number of acres required to mitigate the wetlands impacts would be determined after deliberations between the FDEP, St. John's River Water Management District, and the Army Corps of Engineers.

In addition, mitigation measures have been developed to minimize potential environmental impacts. Table 4.2.1 lists the pollution prevention and mitigation measures that Southern Company and OUC would implement during the construction and operation of the proposed facilities.

Table 4.2.1. Pollution prevention and mitigation measures developed for the proposed facilities at the Stanton Energy Center

Environmental issue	Pollution prevention or mitigation measure
Atmospheric resources and air quality	During construction, use of modern, well-maintained machinery and vehicles meeting applicable emission performance standards would minimize emissions. The distances of most construction-related activities from the nearest property boundary and residential area would mitigate any potential impacts. During operation, a number of means would be employed to prevent or reduce emissions of air pollutants, including: • Application of Best Available Control Technology, as required. • Enclosure of coal unloading, transfer and conveying equipment, plus application of water sprays, as needed, and use of baghouses at key transfer points. • Use of high-temperature, high-pressure filters within the gasification process to collect particulate matter from the synthesis gas. • Use of sulfur removal technology to reduce sulfur concentrations in the synthesis gas. • Use of activated carbon to remove mercury from the synthesis gas. Monitoring to ensure compliance with emission limits would be carried out during operation. It is expected that the proposed facilities would be subject to Clean Air Interstate Rule (CAIR), Clean Air Mercury Rule (CAMR), applicable New Source Performance Standards, and 40 CFR Part 75 (Acid Rain Program). In general, these federal rules require continuous monitoring and recording of SO_2, NO_x, and mercury emissions. Monitoring would be subject to stringent QA/QC requirements to ensure that the monitored emissions data are accurate and complete. Initial and periodic compliance testing of pollutants emitted by the proposed facilities would be conducted pursuant to Florida Department of Environmental Protection requirements. This stack testing, using EPA reference methods, is expected to address the principal air pollutants emitted by the proposed facilities, including CO, VOCs, and PM-10. An extensive network of area ***gas detectors*** would continually sample for H_2S and other compounds. Detection would trigger actions to eliminate equipment leaks.

Table 4.2.1. Continued

Environmental issue	Pollution prevention or mitigation measure
Surface water resources	Runoff during construction and operation, as well as all effluents from operation of the proposed facilities, would flow through the existing Stanton Energy Center collection and reuse system. No offsite discharges would occur, except during a major storm event and from the small area impacted by the short transmission line interconnection.
	To prevent the deposition of sediments beyond the construction areas, site-specific Best Management Practices would be selected, potentially including silt fences, hay bales, vegetative covers, and diversions, to reduce impacts to surface water.
	As part of the dewatering during construction, surface water monitoring would be consistent with the Noticed General Permits for Consumptive Uses (SJRWMD). Samples collected from the backside of the appropriate turbidity barriers would be analyzed, and the results submitted for agency review, as required.
	Cooling tower blowdown, process effluents, and runoff/leachates generated by/from proposed operations would be discharged to the existing Stanton Energy Center wastewater management and reuse systems. No process wastewater would be directly discharged to any surface waters.
	A Spill Prevention, Control, and Countermeasures Plan would be followed to minimize the opportunity for accidental spills, and identify the appropriate procedures to be followed in case of an accidental spill.
Geological and hydrogeological resources	In the unlikely event of a fuel spill or other release, assessment and recovery of the spill or release would be conducted in accordance with Florida Department of Environmental Protection requirements.
	The new coal pile would be lined and leachate collected to prevent the introduction of pollutants into groundwater.
	Use of treated wastewater effluent and other reclaimed water for cooling water makeup would minimize the withdrawal and consumption of Floridan aquifer groundwater.
	Measurement programs specified in Section XI of the Stanton Energy Center Conditions of Certification would continue to monitor groundwater withdrawal rates from the Upper Floridan aquifer, as well as water levels and quality in the surficial and Upper Floridan aquifers.

Table 4.2.1. Continued

Environmental issue	Pollution prevention or mitigation measure
Floodplains and wetlands	Siting of the proposed facilities on previously disturbed land would prevent any impacts to floodplains and most, if not all, impacts to wetlands. Some wetlands could be impacted by construction of the short transmission line interconnection.
	A survey of all potentially impacted land has identified wetlands that could be disturbed. A plan to mitigate potential impacts would be prepared in accordance with state, DOE, and other federal requirements.
Ecological resources	An ecological resources characterization program has been conducted on the site. Location of the proposed facilities within previously impacted areas (except for the transmission interconnection) would prevent most or all impacts to terrestrial resources, including rare, threatened, or endangered species.
Noise and EMF	During both construction and operation, distance of separation would render most or all noise associated with the project (except perhaps steam blows) imperceptible at offsite locations and below limits set in the Orange County Ordinances. An appropriate level of sound control (baffling, silencers) would be designed into facility equipment to limit operational noise levels.
	Compliance with Florida design and regulatory standards would result in minimal, if any, offsite EMF from the transmission interconnection.
Human health and safety	As required by law, Southern Company and OUC would add project-specific health and safety-related plans to those already in place for existing Stanton Energy Center units to address unique features of proposed operations. Potential adverse impacts would be prevented or minimized by implementation of these plans, which would include appropriate training and supervision of employees and enforcement of workplace safety policies in accordance with regulatory standards.
	All processes and equipment would be designed and constructed for safe operation. An extensive network of area monitors would detect any leaks of potentially hazardous chemicals.
	Southern Company and OUC would develop and implement a Process Safety Management program for the chlorine and ammonia systems to identify hazards associated with each chemical. The Process Safety Management program would establish emergency response measures as well as specify training protocols.

Table 4.2.1. Concluded

Environmental issue	Pollution prevention or mitigation measure
Human health and safety (continued)	Excess ammonia generated at the proposed facilities would be handled and transported in accordance with the Department of Transportation's hazardous materials regulation.
Cultural resources	Proposed construction would occur at large distances from documented archaeological and historic resources.
Land use	With the exception of the short transmission line interconnection, construction of the proposed facilities would occur on previously disturbed land. Permanent project facilities would occupy only 35 acres (not including area for the gasification ash landfill, if needed). Gasification ash would, as the preferred options, either be burned in the existing Units 1 and 2 or sold for use off the site, thereby eliminating or reducing landfill requirements.
Transportation	A "Construction Traffic Impact Mitigation Program" similar to elements of the one found in the current Stanton Energy Center Conditions of Certification would be developed and implemented. Such a program could include encouraging construction workers to carpool; working with the local mass-transit system to provide workers with a park-and-ride service to the site; using the existing railway access to the Stanton Energy Center site for the delivery of some construction equipment and materials; staggering construction work schedules and shifts to avoid peak traffic hours; and working with Florida DOT to provide temporary traffic control devices and alter signal times to assist in maintaining proper traffic flow. If the Avalon Park Boulevard extension project is completed prior to project construction, traffic issues would largely be mitigated and more modest mitigation would be considered. However, it is not expected that any mitigation steps contemplated would eliminate traffic impacts.
Aesthetics	The proposed facilities would be constructed within an existing power plant site. Screening provided by existing units and intervening vegetation would largely mitigate potential visual impacts of equipment at offsite vantage points.

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4.3 ENVIRONMENTAL IMPACTS OF NO ACTION

Under the no-action alternative, DOE would not provide cost-shared funding for the design, construction, and demonstration of the proposed Orlando Gasification Project at OUC's Stanton Energy Center near Orlando, Florida. Without DOE participation, Southern Company and/or OUC could reasonably pursue at least one option (Section 2.3.1). The combined-cycle facilities could be built at the Stanton Energy Center without the gasifier, synthesis gas cleanup systems, and supporting infrastructure. The combined-cycle facilities would operate using natural gas as fuel without the availability of synthesis gas. Approximately the same amount of electricity would be produced. The 3,200-ft transmission line would still be constructed and installed to serve as an electrical interconnection to an existing onsite substation.

Under this no-action scenario, for most resources, environmental impacts would be slightly less or nearly identical to those predicted for the proposed Orlando Gasification Project. The minimal impacts to geology, soils, floodplains, and ecology predicted for the proposed facilities would be the same for this scenario. Construction-related impacts would be similar. Somewhat less land would be needed, because the gasification island would not be built. Therefore, slightly less site preparation would be required. Also, the natural gas-fired unit would require no new coal storage pile.

The construction work force, both peak and average, would be reduced, and the period of construction would be cut from 28 months to 24 months. The associated construction-related traffic would also be reduced in terms of both duration and total volume. Positive economic benefits would be less, relative to the proposed Orlando Gasification Project. The smaller, shorter-duration construction work force would yield fewer wages, associated taxes, and spending for goods and services.

During operation of the natural gas-fired unit, emissions of air pollutants (e.g., SO_2 and NO_x) would be less than those predicted for the proposed Orlando Gasification Project (based on air emissions displayed in Table 2.1.1 for the existing natural gas-fired combined-cycle Unit A). The flare required for the proposed facilities would not be required. Emissions of CO_2 would be lower (about 0.56 million tons per year).

Cooling water requirements would be about 20% less than for the proposed facilities, or about 2.1 million gal per day, on average. Releases of water from the Orange County Eastern Water Reclamation Facility would be reduced by 3.2 ft^3/s, on average, compared to a reduction of 4 ft^3/s, on average, for the proposed facilities. However, the withdrawal and use of Floridan aquifer groundwater would be the same as for the proposed facilities. Noise would essentially be the same.

The two to three additional trains per week associated with the proposed Orlando Gasification Project would not be needed to deliver coal to the Stanton Energy Center. Because no ash would be generated, no disposal sites would be needed to accommodate ash. No elemental sulfur or anhydrous ammonia would be produced. Because no new coal pile would be needed or ash disposal site required, localized contamination would be less likely to shallow groundwater from infiltration of runoff from the coal storage pile or from placement of ash in the onsite coal-combustion ash landfill. Also, somewhat less stormwater runoff would require treatment.

The natural gas-fired unit would require fewer employees to operate (approximately 21 rather than 72), which would reduce traffic, but would also reduce economic benefits. Other traffic associated with delivering supplies and removing byproducts would be less. However, unlike for the proposed Orlando Gasification Project, trucks would continue to deliver anhydrous ammonia to the site once per week for use by the selective catalytic reduction systems on Units 2 and A.

The Stanton Energy Center's existing units would continue to operate without change. Levels of resources used and emissions, effluents, and wastes discharged would remain the same at the existing unit.