6. CUMULATIVE EFFECTS

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

Because cumulative impacts accrue to resources, the analysis of impacts must focus on specific resources or impact areas as opposed to merely aggregating all of the actions occurring in and around the proposed facilities and attempting to form some conclusions regarding the effects of the many unrelated actions. Narrowing the scope of the analysis to resources where there is a likelihood of reasonably foreseeable impacts accruing supports the intent of the NEPA process, which is "to reduce paperwork and the accumulation of extraneous background data; and to emphasize real environmental issues and alternatives" [40 CFR Part 1500.2(b)]. The resources and impact areas that were identified with a likelihood of such impacts are (1) atmospheric resources, including CO_2 emissions contributing to global climate change; (2) groundwater resources and related withdrawal issues; (3) social and economic resources and related traffic congestion issues; (4) noise issues; and (5) ecological resources, including wetland issues. The lack of impacts to other resources directly affected by the proposed project precludes other resources from this cumulative effects analysis.

Each resource analyzed has an individual spatial (geographic) boundary, although the temporal boundary (time frame) can generally be assumed to equal the 20-year life expectancy of the proposed facilities. For air quality, a 31-mile radius around the Stanton Energy Center was used in the analysis; for greenhouse gases including CO_2 emissions, a global spatial boundary was used; for groundwater resources, the Orange County portion of the St. Johns River Water Management District was used as the spatial boundary; for social and economic resources, eastern Orange County was used; and for noise and ecological resources, a few-mile radius around the Stanton Energy Center was used.

For air quality, the analysis in Section 4.1.2.2 indicated that maximum predicted concentrations would be less than the significant impact levels. Therefore, additional modeling including other sources and background concentrations is not required under air quality guidelines for regulatory permitting of the facilities (EPA 1990). Correspondingly, the significant impact levels could be used

as thresholds for determining the potential for cumulative impacts under NEPA. Because the analysis indicated that maximum predicted concentrations would be less than the significant impact levels, the proposed facilities would not likely contribute to measurable cumulative air quality impacts under air quality guidelines for regulatory permitting of the facilities.

However, as discussed in Section 4.1.2.2, although additional modeling including other sources and background concentrations was 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 highest ambient concentrations measured in the Orlando area (Table 3.2.1, which incorporated all existing sources, including those at the Stanton Energy Center). The results were compared with the ambient air quality standards (Table 4.1.2). The total impact (second column from the right in Table 4.1.2) was the sum of the 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 was less than 60% of its respective standard (the rightmost column in Table 4.1.2). Consequently, significant cumulative air quality impacts from the sum of the proposed facilities and existing sources, including those at the Stanton Energy Center, would not be expected.

As discussed in Section 4.1.2.2, 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 would be 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 $\mu g/m^3$ (Table 4.1.1) would be only 7% of its corresponding NAAQS of 65 $\mu g/m^3$ (Table 3.2.1). Similarly, the maximum modeled annual PM-2.5 concentration of 0.4 $\mu g/m^3$ (Table 4.1.1) would be about 3% of its corresponding NAAQS of 15 $\mu g/m^3$ (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 was about 87% of its respective standard (i.e., the sum of the modeled 4.4 $\mu g/m^3$ and the highest ambient background concentration of 52 $\mu g/m^3$ in Table 3.2.1 would equal 56.4 $\mu g/m^3$, which is 87% of 65 $\mu g/m^3$). Similarly, the highest total impact for the annual PM-2.5 concentration was 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 would equal 12.4 $\mu g/m^3$, which is 83% of 15 $\mu g/m^3$). Consequently, significant 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.

Furthermore, construction air permits issued after January 1, 2004, by the Florida Department of Environmental Protection for facilities located within 31 miles of the Stanton Energy Center were reviewed to identify other planned emission sources. Although 22 smaller (so-called non-PSD) construction permits were issued, no larger (PSD) permits were issued during this period within this distance from the Stanton Energy Center. Fifteen of the non-PSD permits were issued for locations in Orange County, and the remaining seven permits were issued to facilities in Seminole, Brevard, and Osceola counties. Proposed activities ranged from the construction of spray paint booths to the

construction of a drum mix asphalt plant. Each of these activities addressed by the permits would emit air pollutants and, once built and operating, would have some impact on air quality near each source. Potential cumulative impacts with the proposed facilities at the Stanton Energy Center would depend on distance of separation, types and quantities of pollutants emitted by the other sources, and meteorological conditions. Given the small (non-PSD) emission quantities permitted for the other facilities, any potential cumulative impacts with emissions from the proposed facilities would likely be minimal.

As discussed in Section 4.1.2.2, the proposed facilities would increase global CO_2 emissions resulting from fossil fuel combustion, which were estimated at ***26,000*** million tons for the year ***1999 (IPCC 2001)***, 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).*** Emissions of CO_2 over the 20-year commercial life of the project would add about 36 million tons to global emissions over that time frame. ***The total emissions of CO_2 from all units at the Stanton Energy Center are estimated to be about 10 million tons per year. Total emissions of CO_2 from all units at the Stanton Energy Center over the 20-year commercial life of the project would add about 200 million tons to global emissions over that time frame.***

The net effects of market penetration of IGCC technology would depend upon assumptions regarding the mix of technology being displaced. For ***example, the*** displacement of conventional coal-fired power plants ***would result in lower emissions***; whereas, displacement of natural gas fired power plants would generally result in net increases in impacts. Although projections of net effects of commercialization of IGCC technology alone are not currently available, DOE has ***made projections of the market penetration of various technologies under various scenarios of fuel prices and regulations in order to estimate the benefits of the implementation of the fossil energy R&D program (DOE March 2006). This analysis considers the potential market penetration of fossil energy technologies, as well as nuclear and renewable energy technologies. Depending on the scenario considered, the implementation of the fossil energy R&D program would result in IGCC capturing from 3% to 9% of the total market by 2025. Since fossil energy would still provide a substantial portion of the nation's electricity supply under all scenarios, the analysis shows that implementation of the fossil energy R&D program, which includes IGCC, would result in emission reductions of NO_x, SO_2, and CO_2 by the year 2025, relative to a scenario that does not involve fossil energy R&D and the subsequent advancement of IGCC technology.***

Use of Upper Floridan aquifer groundwater by the proposed facilities would contribute to the regional trend of increasing withdrawals from the aquifer and the continued lowering of the aquifer's potentiometric surface, which in turn causes reduced flow to springs and increases the potential for saline or brackish water to migrate into water-supply aquifers (Section 3.4.3). The groundwater requirement for the proposed facilities (about 0.1 million gal per day) would be a very small contributor to regional groundwater demand — about 0.1% of the projected increase in groundwater use in the Orange County portion of the St. Johns River Water Management District between 1995 and 2025, and less than 0.05% of the total groundwater use projected for that same area in 2025.

Because the increment in groundwater use for the project would be within existing permitted limits established for the Stanton Energy Center, the increment has already been accounted for in the water district's assessments of future water supply.

Construction and operation of the proposed facilities would combine with other ongoing and planned activities near the Stanton Energy Center to create cumulative impacts on the area's social and economic resources. The largest contribution to cumulative impacts from the proposed facilities would be the presence of 600 to 700 additional workers during the 9-month peak construction period. Other activities that would contribute to cumulative impacts include the ongoing and planned residential, commercial, and industrial developments north and south of the Stanton Energy Center and the planned Avalon Park Boulevard extension project north and west of the Stanton Energy Center.

As discussed in Section 3.1.2, the proposed Morgan Planned Development and the existing Avalon Park Development are located just north of the Stanton Energy Center. Ongoing and planned developments such as these in eastern Orange County have already created impacts on local socioeconomic resources, particularly water and wastewater services, schools, and the local road network (especially Alafaya Trail). These cumulative impacts would be exacerbated during construction of the proposed facilities. A similar situation exists south of the Stanton Energy Center with the International Corporate Park (Section 3.1.2). Development of the International Corporate Park could combine with construction of the proposed facilities to create cumulative impacts on socioeconomic resources, particularly water and wastewater services and the local road network.

The planned activities that are likely to have the greatest cumulative impacts to socioeconomic resources are the Avalon Park Boulevard extension and the widening of Alafaya Trail from two to four lanes (Section 3.7.7.1 and Section 4.1.7.7). As of spring 2006, work on these road projects has not begun and might not be completed in time to alleviate traffic flow during the peak construction period for the proposed facilities (fall 2008 through spring 2009). If the road projects are completed before the peak construction period, especially if Alafaya Trail is expanded to four lanes, they would help reduce the traffic impacts associated with construction of the proposed facilities. However, if work on the road projects coincides with construction of the proposed facilities, major cumulative impacts would be experienced (i.e., reduced traffic flow and reduced safety on the local road network). This would likely result in considerably longer traffic delays than exist under current conditions ("F" level-of-service) during peak traffic hours on Alafaya Trail. After completion, the roadway would relieve some traffic on Alafaya Trail, and the cumulative effects of the roadway with respect to the proposed project would be beneficial.

Roadway construction, which would occur on the periphery of the Stanton Energy Center site, would generate noise. After roadway completion, traffic on the roadway would also generate noise. Due to the attenuation of noise with distance, an observer subject to noise from two equal sources, one closer to the observer than the other, hears more of the sound generated by the closer source. Thus, noise generated by the proposed facilities would likely be nearly imperceptible at locations along Alafaya Trail and in Avalon Park during periods of noise generated by nearby road

construction. The same result is likely at locations along Alafaya Trail and in Avalon Park after the road project is completed (i.e., noise from traffic on the roadway would likely mask noise generated by the proposed facilities).

The Avalon Park Boulevard extension project would impact the buffer area of the Stanton Energy Center. When construction of the road project begins, new stresses would be expected to vegetation, wetlands, and wildlife on the Stanton Energy Center property. The new roadway would impact existing natural resources (i.e., wetlands and listed plant and animal species) along its route, including the Stanton Energy Center site. The roadway would add to the ongoing threat to the area's biodiversity caused by extensive development, which has cleared land, fragmented habitat, altered the hydrological regime, and increased the pressure from human population. An extensive route selection study preceded selection of the proposed route, which attempts to minimize impacts to these resources.

Because the road project would fill a total of 4.2 acres of wetlands, a mitigation plan for wetland impacts has been developed for the project. On the Stanton Energy Center property, the wetlands consist of a long ditch along the western property border, which would be relocated to the eastern edge of the new roadway. Because wetland impacts from the proposed facilities would be minimal, if any, and the project would not interfere with the mitigation plan being implemented for the road project, the proposed facilities should have negligible, if any, wetland impacts that would be cumulative with those of the road project.

Eighteen species of listed plant and animal species were noted in a survey as possibly present on the road project route. The bald eagle, wood stork, red-cockaded woodpecker, scrub jay, alligator, and indigo snake are federally-listed species with a moderate, high, or confirmed likelihood of occurrence on the land to be impacted by the road project. None of these species was found exclusively on the Stanton Energy Center property. The gopher tortoise, a state-listed species of special concern, was documented on the Stanton Energy Center site. A gopher tortoise mitigation plan has been developed for the road project, which includes tortoises on the Stanton Energy Center property.

The presence of the gopher tortoise indicates other listed associated species could also occur, such as the indigo snake, a federally-listed species, and the Florida mouse, a state-listed species. The U.S. Fish and Wildlife Service issued a biological opinion, concluding that the road project would not likely adversely affect the bald eagle or the eastern indigo snake (FWS 2002). However, the biological opinion concluded that the road project would likely negatively affect one cluster of red-cockaded woodpeckers located south of the Stanton Energy Center property on the International Corporate Park property. After review, the U.S. Fish and Wildlife Service allowed for the road project's removal of the red-cockaded woodpecker habitat, contingent upon relocation of the birds to the Hal Scott Regional Preserve and Park, located east of the International Corporate Park and Stanton Energy Center properties. Other contingencies in the approval included (1) creation of artificial nest cavities for the birds on the Hal Scott Regional Preserve and Park and (2) monitoring of the birds' status (i.e., success of the relocation) for at least 5 years.

Because the proposed facilities would be constructed almost entirely on cleared, disturbed lands that contain no significant ecological features and are not important habitats for any listed species, the proposed facilities would not appreciably impact ecological resources in the region. Given that the red-cockaded woodpeckers affected by the road project would be relocated off the site and further from the proposed facilities, no further impacts to them should result from construction and operation of the proposed facilities.