5.10 Measures and Controls to Limit Adverse Impacts During Operations

Sections 5.1 through 5.9, 5.11, and 5.12S identify potential adverse environmental impacts that may result from operation of STP 3 & 4 and measures and controls to avoid, minimize, or mitigate those impacts. All proposed measures and controls comply with:

- Applicable local, state, and federal, ordinances, laws, and regulations intended to prevent or minimize adverse environmental effects.
- Applicable requirements of all environmental permits and licenses.
- STP procedures and processes.

Table 5.10-1 is a summary of the adverse impacts due to operation of STP 3 & 4, as identified in previous sections, the significance level of the impacts, and the possible mitigation measures to be implemented beyond those identified above.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.1 Land-Use Impacts			
5.1.1 The Site and Vicinity	Approximately 90 acres of land will be permanently dedicated to the plant until decommissioning. [2]	S	There are no practical measures of mitigation for this impact.
	Salt deposition affects to vegetation potentially impacting land use in the surrounding area.	S	Salt deposition in the immediate vicinity of the cooling tower, out to 660 feet from the centerline of the cooling towers, is predicted to have a maximum of 420 pounds per acre per month during the Summer season. Salt deposition in all areas greater than 1300 feet from the centerline of both the cooling towers will be below 8.9 pounds per acre per month, which is the NUREG-1555 threshold for leaf damage. Cooling tower and heat dissipation system will be monitored for operate under rules and regulations governing these systems.
	Offsite land use impacts attributed to operations workforce population growth. Increase in development for commercial and residential purposes. [2]	S-M	Maintain communication with local and regional government to disseminate project information so they have the opportunity to plan accordingly.
	Operation of new units would result in an increase in the total volume of solid waste generated at the STP site. [2]	S	All federal, Texas, and local requirements and standards would be met regarding handling, transportation, and offsite land disposal of the solid waste at licensed facilities. STPNOC has recycling and waste minimization programs currently in place.
5.1.2 Transmission Corridors and Offsite Area	Impacts to offsite land from disposal of radiological (low and high level) and non-radiological wastes that would be generated at STP 3 & 4. The wastes would be disposed of in offsite disposal facilities. [2]	S	Disposal area(s) for non-radiological and low level radiological waste would be a permitted waste disposal facility with a land use designated for such activities. For high level wastes. Disposal area would be operated under appropriate regulations and guidelines until such time an NRC-licensed high-level waste disposal facility is constructed. At that time, the storage area could be restored for other uses.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.1.3 Historic Properties	Potential impacts to historic resources due to operation of project.	NA	Texas Historical Commission concurs that ongoing operations and maintenance activities of STP 1 & 2 would have no effect on historic properties. Since no additional corridors are required for STP 3 & 4, there should also be no effect on historic properties.
5.2 Water-Related Impacts			
5.2.1 Hydrologic Alterations and Plant Water Supply	Potential hydrologic impacts from the withdrawal from the Chicot Aquifer. Makeup water for the ultimate heat sink (mechanical draft cooling towers) would be pumped from five existing and proposed groundwater wells. [2]	S	STPNOC will apply to Coastal Plains Groundwater Conservation District for an increase in the site's current groundwater permit from 3000 acre-feet per year to 3500 acre-feet per year up to the current permitted limit with the remainder of the water requirements met by water from the Main Cooling Reservoir (MCR). Withdrawal groundwater from the deep confined Chicot aquifer, limiting impacts to those local wells in the deep aquifer. Conduct groundwater monitoring as required by groundwater use permit.
5.2.2 Water-Use Impacts	Potential hydrologic impacts to the Colorado River from pumping of water to the MCR. Water would be withdrawn from the Colorado River and added to the MCR to replace water lost to evaporation, seepage, blowdown from the MCR, and as needed as the result of maximum operating conditions at the rate of 42,604 gpm during normal operations and 44,779 gpm during maximum operations, as contained in the current permit. [2]	S	No mitigation would be required.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.2.3 Water Quality Impacts	Potential water quality impacts to the Colorado River from discharges from the MCR, which would receive and dilute all STP 3 & 4 water and wastewater discharges. Discharges to the Colorado River are anticipated to be needed when water quality deteriorates in the MCR. Discharge limits would be established by the Texas Commission on Environmental Quality (TCEQ).	S	Obtain Texas Pollution Discharge Elimination System (TPDES) permit and comply with its discharge limits and monitoring requirements.
5.3 Cooling System Impact			
5.3.1 Intake System	Entrainment, impingement and entrapment of aquatic organisms at the power plant water intake structure. [2]	S	Intake structure is designed with the “Best Available Technology.” The MCR is a closed cycle cooling system that minimizes withdrawal of river water. Impingement, entrainment and entrapment were minimized by other design features: (1) the intake was oriented in such a way as to reduce attractant flows, (2) the approach velocity at the traveling screens was designed to be 0.5 fps or less, and (3) the RMPF was equipped with a fish “handling and bypass” system. This is a pre-existing system, so no mitigation is anticipated.
5.3.2 Discharge System	The addition of STP 3 & 4 is expected to increase the frequency of blowdown from the MCR to the Colorado River. [2]	S	Obtain TPDES permit and comply with its discharge limits and monitoring requirements. The MCR would be operated such that discharges would not be made when the river flow is less than 800 cubic feet per second (cfs) and the volume would not exceed 12.5% of river flow, allowing a dilution of the already diluted STP 3 & 4 cooling system effluent of at least 8.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
	Non-radioactive wastewater discharges will increase as a result of the operation of the new units' operation, such as additional cooling water system blowdown, permitted wastewater from the new units' auxiliary system, and storm water runoff from new impervious surfaces. [2]	S	Discharges would be in accordance with applicable TCEQ water quality standards. STPNOC will revise the existing Storm Water Pollution Prevention Plan (SWPPP). The impacts due to the new impervious surfaces will be negligible due to Best Management Practices.
	Impacts to the Colorado River riverbed due to discharge from the MCR.	S	Discharges would be diffused to limit scouring to immediate area of the discharge point.
5.3.3 Heat-Discharge System			
5.3.3.1 Heat Dissipation to the Atmosphere	Potential visual impacts from cooling tower plumes.	S	Operation of the STP 3 & 4 cooling towers would result in plumes that would occur in each direction of the compass and would be spread over a wide area, reducing the time that the plume would be visible from any particular location. The average plume lengths would be short and would not be long enough to reach the site boundary in most directions. No mitigation would be required.
	Potential impacts to agriculture and vegetation in the area due to atmospheric effects from operations of the STP 3 & 4 cooling towers.	S	Operation of the cooling towers could lead to minor shadowing, very small increase in precipitation, increases in ground-level humidity in the immediate vicinity, and salt deposition that is a fraction of the level needed to have visible effects on vegetation outside the site boundaries (greater than 1300-feet). No mitigation would be required.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.3.3.2 Terrestrial Ecosystems	Potential stressing of vegetation within the site boundary from salt deposition resulting from the operation of the STP 3 & 4 cooling towers. Vegetation stress could result either directly by deposition of salts onto foliage or indirectly from accumulation in the soil. [2]	S	Salt deposition from mechanical cooling tower operation would be a fraction of the level that leads to leaf damage outside of a 1300-feet radius from the cooling towers. Mitigation would not be required.
	Inclusion of STP 3 & 4 in the existing cooling reservoir system will lead to an increase in operating water level, potentially impacting existing shoreline vegetation and terrestrial biota using the reservoir. [2]	S	Prey species will eventually recolonize along the new shoreline. There are other foraging areas in the vicinity until recolonization. Further mitigation would not be required.
	Potential impacts to wildlife from noise from the STP 3 & 4 cooling towers.	S	Noise from cooling towers singly and cumulatively would be less than the level that startles birds or small mammals beyond the immediate vicinity of the towers. No mitigation would be required.
	Potential impact to avian populations from collisions of individuals with cooling towers. [2]	S	Cooling towers of a low height would be used. Low height would cause negligible mortality in birds.
5.3.4 Impacts to Members of the Public	Potential impact to members of the public from noise emitted by STP 3 & 4 cooling towers.	S	Noise levels 400 feet from the cooling towers are estimated to be less than <60-65 dBA, a level characterized by NRC in NUREG-1555 as of small significance. No mitigation would be required.
	Potential health impact to members of the public from contact with human disease-causing thermophilic microorganisms in the MCR.	S	No mitigation would be required since access to the MCR is restricted and design and operation of the MCR does not promote an average temperature that is optimal for thermophilic microorganisms.
5.4 Radiological Impacts of Normal Operation			
5.4.1 Exposure Pathways	Potential impacts to environment due to small discharges of radioactive liquids and gases. [2]	S	Monitor radiological releases as required by radiological monitoring program.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.4.2 Radiation Doses to Members of the Public	Potential impacts to the public within 50 miles of the plant.	S	Potential liquid pathway doses would be 2.93E-4 millirem per year per unit for total body for the maximally exposed individual and 0.0017 person-rem per year (2 units) for collective total body doses to the public within 50 miles. Potential gaseous pathway doses would be 0.4 millirem per year for total body for the maximally exposed individual and 0.50 person-rem per year for the collective total body Monitor radiological releases as required by radiological monitoring program.
5.4.3 Impacts to Members of the Public	Potential health impacts to members of the public from exposure to radiological releases. Modeling using the design and operational parameters of STP 3 & 4 results in estimated doses to the public that are within the design objectives of 10 CFR 50 Appendix I and within regulatory limits of 40 CFR 190.	S	Monitor radiological releases as required by radiological monitoring program.
5.4.4 Impacts to Biota Other than Members of the Public	Potential impacts to terrestrial and aquatic ecosystems from chronic radiation exposure (much less than 100 mrad/day) caused by the small discharges of radioactive liquids and gases from the operation of STP 3 & 4.	S	Monitor radiological releases as required by radiological monitoring program.
5.4.5 Occupational Radiation Doses	Potential health impacts to workers from radiation exposure of an annual maximum of dose of 98.9 person-rem per unit.	S	Monitor radiological releases as required by radiological monitoring program.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.5 Environmental Impact of Waste			
5.5.1 Non-Radioactive Waste System Impacts	Potential impacts to water quality of Colorado River from increase in discharges from the MCR. The reservoir would be receiving an increased volume of wastewater, increased amount of chemicals in its receipt of water and wastewater from STP 3 & 4 systems, and treated wastewater from a new sanitary waste treatment system.	S	Obtain TPDES permit and comply with its discharge limits and monitoring requirements.
	Potential impacts to water quality of surface water due to increased volume of storm water resulting from new impervious surfaces. [2]	S	Conduct storm water monitoring as required by storm water permit. Revise the SWPPP to avoid/minimize releases of contaminated water.
	Potential impacts to air quality from emissions of auxiliary systems operated on an intermittent basis. [2]	S	Comply with the state of Texas permit limits and regulations for operating air emission sources.
	Operation of new units would result in an increase in the total volume of solid waste generated at the STP site. Potential impacts to environment offsite due to disposal of solid waste generated as a result of the operation of STP 3 & 4. [2]	S	Implement existing no radioactive solid waste reuse and recycling policies.
5.5.2 Mixed Waste Impacts	Potential impacts to environment offsite due to disposal of up to 5 cubic meters of mixed waste that could be generated as a result of the operation of STP 3 & 4.	S	Update existing STP waste minimization plan for operation of STP 3 & 4.
	Potential health impacts to workers due to potential exposure to chemicals during handling and storage of mixed wastes.	S	Implement materials handling and safety procedures.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
	Potential health impacts to offsite workers and emergency response personnel due to exposure to chemical and radiological hazards during accidental releases and cleanup activities.	S	Revise Integrated Spill Contingency Plan as necessary to address handling and transport of mixed waste generated at STP 3 & 4.
5.6 Transmission System Impacts			
5.6.1 Terrestrial Ecosystems	Potential impacts to vegetation and habitat within the transmission line rights of way from routine maintenance of woody vegetative growth by manual and mechanical methods and herbicides.	S	There will be no increase in transmission line maintenance due to the addition of STP 3 & 4. Mitigation is not required for current maintenance activities associated with STP 1 & 2; therefore, mitigation is not anticipated with the addition of STP 3 & 4 (Note: maintenance is performed the transmission system owners).
5.6.2 Aquatic Ecosystems	Potential water quality impacts and subsequent impacts to populations of important aquatic species from maintenance activities in transmission corridors that lie at or near water bodies and wetlands.	S	There will be no increase in transmission line maintenance due to the addition of STP 3 & 4. The use of chemicals (chiefly herbicides) in right-of-way vegetation management is also a public concern, but potentially toxic effects of these chemicals are mitigated by the use of EPA-registered formulations that are approved for use in utility rights-of-way. All four of the transmission service providers require chemical applicators to be trained in the safe use of herbicides and require supervisory personnel to hold Texas Department of Agriculture Commercial Pesticide Applicators Licenses (Note: maintenance is performed the transmission system owners).
5.6.3 Impacts of Members of the Public	Potential health impacts to members of the public from transmission lines.	S	Induced current from transmission lines would be less than 5 millamperes. No mitigation would be required.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.7 Uranium Fuel Cycle Impacts			
5.7.1 Land Use	Potential impacts to land use from fuel cycle. Total annual land requirements for fuel cycle support would be 21 permanently committed acres and 160 temporarily committed acres per unit.	S	Impacts to land from the fuel cycle, in comparison with land requirements for fossil fuel fired plant, are small and mitigation would not be required.
5.7.2 Water Use	Potential impacts to water resources from fuel cycle. Total annual water use for the fuel cycle would be 1.82×10^{10} gallons per unit. [2]	S	Practical mitigation for this impact does not exist.
5.7.3 Fossil Fuel Impacts	Potential impacts to fossil fuel resources from fuel cycle.	S	Electric energy needs for fuel cycle would be less than 5% of the output of one of the proposed units. Natural gas consumption for fuel cycle support if used instead to generate electricity would yield less than 0.4% of the energy output of one of the proposed units. No mitigation would be required.
5.7.4 Chemical Effluents	Potential impacts to air and water quality from fuel cycle. Gaseous effluents would be less than 0.052% of all 2005 US SO_2 emissions and less than 0.012% of all 2005 US NO_x emissions. Liquid effluents from fuel enrichment and fabrication are subject to federal, state, and/or local requirements and limitations. Milling chemical effluents are not released in quantities sufficient to have significant impacts on the environment.	S	All chemical discharges released into the environment are subject to requirements and limitations set by an appropriate federal, state, or local agency.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.7.5 Radioactive Effluents	Potential health impacts to members of the public from radioactive effluents from the fuel cycle. The estimated whole-body population dose commitment to the U.S. population would be approximately 2600 person-rem per year per unit an estimate that correlates with 1.9 fatalities per year to the U.S. population.	S	No mitigation would be required.
5.7.6 Radioactive Waste	Potential environmental impacts from disposal of radioactive wastes generated as a result of the fuel cycle. No significant radioactive releases to the environment are expected from low-level waste disposal. No releases to the environment are expected from the repository disposal of transuranic and high-level waste.	S	Disposal area(s) would be a permitted waste disposal facility with a land use designated for such activities. Disposal area would be operated under appropriate regulations and guidelines until such time an NRC-licensed high-level waste disposal facility is constructed. At that time, the storage area could be restored for other uses.
5.7.7 Occupational Dose	Potential health impacts to fuel cycle workers caused by radiation exposure. The estimated occupational dose (to all fuel cycle workers cumulatively) is approximately 960 person-rem per year per unit.	S	The dose to any individual would be maintained within the dose limit of 10 CFR 20.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.7.8 Transportation	Potential health impacts to transportation workers and members of the public caused by radiation exposure resulting from the loading, unloading, and transport of radioactive materials associated with the fuel cycle. The estimated dose to workers and the public from transportation associated with the fuel cycle is 4 person-rem per year per unit. [2]	S	Limit amounts of waste handled and disposed of through source reduction, recycling, treatment, to the extent practical and feasible. Construct onsite storage facilities, as required, for wastes and implement a waste management program in compliance with applicable regulatory requirements.
5.8 Socioeconomic Impacts			
5.8.1 Physical Impacts	Degradation of roads in the vicinity due to increased traffic from commuting of operations workers and deliveries for STP 3 & 4.	S	Increased tax revenue from STP 3 & 4 will allow for the local government to improve roads as needed.
	Potential impacts to air quality from limited, short-term operation of auxiliary systems.	S	Obtain air permits and operate systems within permit limits and monitor emissions as required.
	Visual impacts to landscape from reactor buildings, cooling towers, and associated plumes.	S	No mitigation would be required.
5.8.2 Social and Economic Impacts	Potential adverse economic impact to Matagorda County residents due to potential increase in rental rates and housing prices due to influx of operations workers. [2]	M-L	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning.
	Increased demand for water by operations workers would further stress water supplies which are predicted by the water planning organization to fall short of water demand after 2010. [2]	S-M	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.8.2 Social and Economic Impacts (continued)	Increased wastewater volume as a result of in-migrating operations workforce would contribute to an overall population-related increase in wastewater volume which could exceed wastewater treatment capabilities in the area. [2]	S-M	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning.
	Potential impact to police and fire department services in Matagorda and Brazoria Counties due to small increases in the ratio of residents/residences to police and firefighters. [2]	S	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning.
	Potential impact to medical services in Matagorda and Brazoria Counties due to medical service needs of in-migrating operations workforce.	S	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning. Increased property tax revenues as a result of the increased population, and, in the case of Matagorda County, property taxes on the new reactors, would fund additional medical services.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.8.2 Social and Economic Impacts (continued)	Impact to Matagorda County schools due to in-migrating operations workforce increasing the student population by an estimated 14 percent. [2]	M-L	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning. Increased property tax revenues as a result of the increased population, and, in the case of Matagorda County, property taxes on the new reactors, would fund additional teachers and facilities for Palacios Independent School District.
	Traffic congestion due to operations and outage workforces commuting. Hourly vehicle capacity would be exceeded during shift changes with only the operations workforce commuting to STP. [2]	M-L	Stagger outage schedules so only one unit will be down at a time. Stagger arrival and departure times.
5.8.3 Environmental Justice Impacts	Low-income rental housing rates could increase due to increased demand for housing, potentially displacing low-income renters in Matagorda County during the construction phase. [2]	S	Analysis of housing availability in Matagorda County determined that the probability of this being an issue is low. Because of this, control efforts would not be necessary.
5.9 Decommissioning			
5.9 Decom-missioning	Potential impact to worker health due to occupational exposures.	S	Continue applicable mitigation measures employed during the operations period for decommissioning activities.
	Potential health impact to transportation worker and members of the public due to exposure to radiological materials during loading, unloading, and transport.	S	Continue applicable mitigation measures employed during the operations period for transportation of waste and materials to disposal sites.

Table 5.10-1 Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.11 Transportation of Radioactive Materials			
5.11.1 Transportation Assessment	Potential heath impacts as a result of transportation of radioactive waste shipments at the estimated rate of 30 normalized shipments per reactor per reactor year.	S	The reactor and transportation of radioactive waste will meet all of the conditions in NRC regulation 10 CFR 51.52.
5.11.2 Incident-Free Transportation Impacts Analysis	Potential health impacts caused by exposure to radiation emitted during transportation of radiological materials. The greatest dose estimated to 15.9 person-rem per reactor year to general public onlookers.	S	Radiological protection programs would manage and limit doses to workers whose jobs would cause them to receive the greatest exposures.
5.12S Non-Radiological Health Impacts			
5.12S Non-Radiological Health Impacts	Impact to worker health due to occupational injuries and illnesses. Total recordable cases of occupational injuries and illnesses estimated per year for the onsite worker population of STP 3 & 4 is 27, 25, and 5 cases based on United States, Texas, and STP 1 & 2 incident rates, respectively.	NA	Implement existing STP industrial safety program at STP 3 & 4.

[1] The assigned significance levels [(S)mall, (M)oderate, or (L)arge] are based on the assumption that for each impact, the associated proposed mitigation measures and controls (or equivalents) will be implemented (10 CFR 51, Appendix B, Table B-1, Footnote 3).

[2] The mitigation measure specified for this impact is insufficient to eliminate or satisfactorily mitigate the impact. No other practical measures for mitigation of this impact are available. Therefore, these impacts will be considered in the evaluation of unavoidable adverse impacts (Section 10.1).