

7.0 ALTERNATIVES TO THE PROPOSED ACTION

The environmental report shall . . . discuss . . . alternatives to the proposed action [10 CFR 51.45(b)(3)]

The applicant shall discuss in this report the environmental impacts of alternatives and any other matters The report is not required to include discussion of need for power or economic costs and benefits of . . . alternatives to the proposed action except insofar as such costs and benefits are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation [10 CFR 51.53(c)(2)]

A reasonable alternative must be commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license, or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license The amount of replacement power generated must equal the base-load capacity previously supplied by the nuclear plant and reliably operate at or near the nuclear plant's demonstrated capacity factor. (NRC 2013b, Section 2.3)

Each energy alternative should meet the purpose of the proposed action (i.e., renewal of a commercial nuclear power plant OL), which is to provide the option to continue plant operations beyond the current OL term. If the WF3 OL were not renewed, the 1,188 MWe of reliable base-load power produced by WF3 would not be available to continue to meet Entergy's system generating needs during the WF3 license renewal period, December 2024 to December 2044. Therefore, because Entergy, a regulated utility, is required to furnish the Louisiana Public Service Commission its plan for meeting customers' long-term power needs and because WF3's power generation is included in this long-term plan, an alternative approach to meeting the electric power requirements of its customers would be needed.

7.1 Replacement Power Alternatives

As discussed in [Section 2.6.2](#), Entergy considered a full range of alternatives for replacement power in the event that the WF3 OL is not renewed. Entergy considered each of the replacement power alternatives reviewed in the NRC's GEIS for license renewal (NRC 2013b, Section 2.3) for their reasonableness as an alternative to continued operation of WF3 to meet power demands of Entergy customers with regard to several criteria. As noted above, the NRC has defined a "reasonable alternative" as one that is commercially viable on a utility scale and operational prior to the expiration of the reactor's OL, or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor's OL (NRC 2013b, Section 2.3). In evaluating reasonable alternatives to the renewal of the WF3 OL, Entergy reviewed both discrete power generation sources for replacement of the base-load generating capacity of WF3 and a combination of sources. If the WF3 OL is not renewed, the 1,188 MWe of reliable base-load power produced by WF3 would not be available to continue to meet Entergy's system generating

needs during the license renewal period, 2024–2044. Any alternative that did not include replacing the base-load generating capacity of WF3 would be unreasonable.

7.1.1 Energy Alternatives Considered As Reasonable

Entergy's review determined that the alternatives listed below met the NRC's criteria for reasonableness for the replacement of WF3's generating capacity during the license renewal period. Each of the following hypothetical alternatives is discussed further in the following subsections.

- NGCC plant at the Entergy Louisiana, LLC property.
- SCPC plant at an alternate site.
- New nuclear plant at the Entergy Louisiana, LLC property.
- Combination of hypothetical alternatives consisting of an NGCC plant and biomass plants at the Entergy Louisiana, LLC property, plus energy savings from DSM programs.

As explained in [Section 2.6.2](#), Entergy determined that the most likely alternative to replace WF3 is an NGCC plant due to economic reasons, and the relatively short development and construction time (approximately 3 years).

7.1.1.1 Natural Gas-Fired Generation

The NGCC plant alternative would be located on previously disturbed land on the Entergy Louisiana, LLC property, and would consist of multiple combustion turbines, heat recovery steam generator, and a steam turbine generator assembled in appropriate power-train configurations. Based on a capacity factor of 87 percent ([EIA 2013a](#)), the replacement NGCC plant would approximately be a 1,366-MWe plant, resulting in the equivalent to WF3's generating capacity of 1,188 MWe. Entergy assumes (1) the NGCC plant would utilize closed-cycle cooling with mechanical draft cooling towers, (2) source of cooling water would be the Mississippi River, (3) existing transmission line infrastructure is adequate, and (4) existing intake and discharge structures can be utilized with some modifications.

7.1.1.2 Coal-Fired Generation

As discussed in [Section 2.6.2](#), Entergy's IRP selected SCPC with carbon capture as a technology for further consideration. Therefore, for purposes of assessing the impacts of energy replacement alternatives, the coal-fired plant alternative uses SCPC technology with carbon capture at an alternate site. Based on an 85-percent capacity factor ([EIA 2013a](#)), the SCPC plant would be a 1,398-MWe plant, resulting in the approximate equivalent to WF3's generating capacity of 1,188 MWe. Entergy assumes (1) the SCPC plant would be located in close proximity to an existing power plant in Louisiana within the Southeast Electric Reliability Corporation (SERC) region, adjacent to a rail line or waterway capable of supporting delivery of coal, and near a geological formation capable of storing carbon emissions to meet new power

plant standards, as proposed (79 FR 1430); (2) existing transmission infrastructure would be sufficient; and (3) closed-cycle cooling with mechanical draft cooling towers would be utilized.

7.1.1.3 Nuclear Generation

The new nuclear plant alternative would be located on the Entergy Louisiana, LLC property on previously disturbed land. Based on a capacity factor of 90 percent (EIA 2013a), the new nuclear unit would be sized to approximately 1,320 MWe, resulting in the equivalent to WF3's generating capacity of 1,188 MWe. Entergy assumes (1) the new nuclear plant would utilize closed-cycle cooling with mechanical draft cooling towers, (2) source of cooling water would be the Mississippi River, (3) existing transmission infrastructure is adequate, and (4) existing intake and discharge structures can be utilized with some modifications.

7.1.1.4 Combination of Alternatives

A combination of hypothetical alternatives for replacing the generating capacity of WF3 consists of the following:

- A 668-MWe NGCC plant operating at an 87-percent capacity factor (EIA 2013a) for a total of 581 MWe.
- Four 50-MWe biomass plants operating at an 83-percent capacity factor (EIA 2013a) for a total of 166 MWe.
- DSM programs providing 441 MWe.

The NGCC plant and biomass plants would be located on the Entergy Louisiana, LLC property on previously disturbed land. For the NGCC plant and biomass plants, Entergy assumes (1) closed-cycle cooling with mechanical draft cooling towers would be utilized; (2) source of cooling water would be the Mississippi River; (3) existing transmission line infrastructure is adequate; (4) existing intake and discharge structures can be utilized with some modifications; and (5) the biomass-fired units would be capable of using a variety of biomass fuels such as wood waste, crop residues, energy crops, and municipal solid waste (MSW) to take advantage of the feedstock options available in the area, as well as for greater assurance of reliable feedstock.

7.1.2 **Energy Alternatives Not Considered Reasonable**

The NRC reviewed a full range of energy alternatives in the GEIS, including alternatives that require new generating capacity and those that do not (NRC 2013b, Section 2.3). Entergy considered alternatives, as presented in the GEIS, for its analysis as discussed in Section 2.6.2. The following sections discuss the energy alternatives not considered reasonable.

7.1.2.1 Alternatives Not Requiring New Generating Capacity

7.1.2.1.1 Purchased Power

Power to replace the capacity of a nuclear unit would have to be purchased from sources within the United States, Mexico, and/or Canada. The power purchased would likely be generated from coal, natural gas, nuclear, or some amount of intermittent renewables such as wind or solar, or a combination of these. Thus, the environmental impacts of purchased power would still occur, but would be located elsewhere within the region, nation, or another country. The description of environmental impacts of generating technologies presented in [Chapter 8](#) of the 1996 GEIS is representative of the purchased power alternative. In addition, purchased power is generally economically adverse in that the cost of generated power has historically been less than the cost of the same power provided by a third party ([NRC 2013c](#), Section 9.2.1).

Purchased power could require new transmission lines to import the amount of energy needed to replace WF3. WF3 electricity is distributed through the Entergy Louisiana, LLC grid, a part of the Entergy Electric System which interconnects Entergy's operating companies. In addition, Entergy Louisiana, LLC's grid is interconnected with three other companies which are not part of the Entergy Electric System: Central Louisiana Electric Company, Southwestern Electric Power Company, and Mississippi Power Company. ([WF3 2014a](#), Section 8.1.1) Entergy Louisiana, LLC is also a member of the Midcontinent Independent System Operator, Inc. (MISO), and WF3 is located within the Delta sub-region of MISO's transmission grid. A recent study of the transmission constraints in Louisiana, Arkansas, and western Mississippi identified much of southeastern Louisiana and southwestern Louisiana as chronically constrained areas with regard to electricity transmission and the ability to import electricity ([Patton 2013](#)). Currently, there is no existing merchant generating facility within southeastern Louisiana that could provide replacement power ([Lanning 2014](#)).

The construction of transmission lines could have both environmental and aesthetic consequences, particularly if new transmission line ROWs have to be acquired. It is not possible to accurately predict the number of acres of land required for transmission system expansion to accommodate replacement of WF3's base-load generating capacity without knowing the location and grid access for generating facilities with reserve capacity available for purchase. If a ROW width of 150 feet or greater were needed for the extremely high voltage portions (345 kV or greater), this committed and disturbed land could amount to more than 1,800 acres per 100 miles of transmission line ROW. Therefore, the local environmental impacts from purchased power would be SMALL where existing transmission line ROWs are used, and could range from SMALL to LARGE if development of new ROWs is required.

Purchasing power from other utilities or power generators is not considered a reasonable or environmentally preferred alternative for replacement of WF3's base-load generation due to transmission constraints and potential land impacts from transmission line expansion.

7.1.2.1.2 Plant Reactivation or Extended Service Life

Entergy's integrated resource planning process involves looking at sustaining existing units as well as adding generating capacity and implementing DSM programs to meet projected electricity demand. The process reviews the entire Entergy Louisiana, LLC fleet and its viability and maintenance needs, and makes informed assumptions with regard to plant life and continued operations. The IRP assumes the deactivation of approximately 5,950 MWe of older gas-fired generating units within the aging Entergy Louisiana, LLC fleet ([Entergy 2015g](#), Part 5). Even if investments in maintenance would be economically sound to allow for delayed retirement/refurbishment of some of the units in the aging Entergy Louisiana, LLC generating fleet, given expected demand, Entergy projects that it will be necessary to add additional generating capacity.

Thus, even if substantial capacity scheduled for retirement could be delayed, the delayed retirement would be needed just to meet load growth. Thus, delayed retirement of other Entergy generating units would not provide a replacement for WF3's base-load generation. Therefore, delayed retirement is not considered a reasonable alternative.

7.1.2.1.3 Conservation or Demand-Side Management

DSM includes energy efficiency programs, energy conservation, and demand response initiatives to reduce energy usage during peak demand periods. To be considered a reasonable alternative, a DSM alternative would need to reduce the base-load demand within Entergy Louisiana, LLC's service territory by 1,188 MWe, which is equivalent to the amount generated by WF3.

To develop its IRP, Entergy reviewed deployment of a full range of existing and potentially deployable DSM programs across the residential, commercial, and industrial sectors served by Entergy. Entergy's DSM program scenarios assumed that WF3 would continue to operate, so the DSM projection component was a means of meeting demand in addition to WF3, not as a replacement. DSM projections were based on a "DSM Potential Study" that estimated the peak load, annual energy reduction, and program costs that result from a low, reference, and high level of spending on program incentives. ([Entergy 2015g](#), Part 2 and Table 19) The DSM Potential Study projected a high of cumulative DSM savings in 2025 of approximately 4 million megawatt hours (MWh) ([ICF 2015](#), Slide 16) or 457 MWe.

The DSM potential within the Entergy Louisiana, LLC service area is not adequate for replacement of WF3's generating capacity. The energy savings for 2025 was projected for three levels of implementation and funding with all the projections falling short of that needed for replacement of WF3's base-load generating capacity ([ICF 2015](#), Slide 16). Therefore, DSM is not considered a reasonable alternative by itself. However, DSM is a component of the combination of alternatives included as a reasonable alternative for replacing WF3's base-load generation.

7.1.2.2 Alternatives Requiring New Generating Capacity

7.1.2.2.1 Wind

Based on the National Renewable Energy Laboratory's (NREL's) wind energy potential estimates, Louisiana's onshore potential is relatively low, with the potential installed capacity reported as 409.8 MW (NREL 2011a), which is less than the amount required for replacement of WF3's base-load generation. Importation of energy from onshore wind would pose the same transmission limitation and the need to develop new transmission lines as discussed in Section 7.1.2.1.1. The construction of roads and turbine tower supports would result in short-term impacts, such as increases in noise, erosion, and sedimentation, and decreases in air quality from fugitive dust and equipment emissions. Installation in undeveloped areas would also have the potential to disturb and impact cultural resources, wetlands, or habitat for sensitive species both during construction and operations. The environmental impacts of a large-scale wind farm are described in the GEIS (NRC 1996, Section 8.3.1; updated in NRC 2013b, Chapter 4). Impacts on aesthetics, land use, and terrestrial ecology from large-scale, land-based wind power facilities could range from SMALL to LARGE.

NREL also reviewed the offshore wind energy potential for the United States and reported Louisiana's offshore wind potential to be 38,798 MW within 3 nautical miles of shoreline at wind speeds of 7.0 to 7.5 meters/second at a turbine height of 90 meters, with the potential increasing at distances of 3 to 12 and 12 to 50 nautical miles from shore (NREL 2010, Table B.1.3). Using NREL data from 2011, the NRC determined Louisiana's offshore areas to have the lowest classification (Fair) for potential for wind energy development (NRC 2013b, Figure D.10-17). Potential impacts of offshore wind energy deployment may be similar to those associated with onshore wind power. A portion of the transmission system would be constructed offshore and would likely consist of buried or submerged cable. Environmental concerns include impacts on marine life, coastal terrestrial communities, avian communities, aesthetics, fishing impacts, and boating and yachting safety, due to the impacts from construction and maintenance (USDOJ 2009, Table E-1).

Therefore, given the offshore wind energy potential for Louisiana and the potential impacts that could result as discussed above, offshore wind as a replacement for WF3's base-load generation is not considered a reasonable alternative.

7.1.2.2.2 Solar Technologies: Photovoltaic Cells and Solar Thermal Power

Generation from solar power is available in two different technologies: concentrating solar power (CSP) and photovoltaic (PV). CSP requires direct solar radiation, but PV can make use of both direct solar radiation and diffuse horizontal radiation.

NREL estimates direct solar radiation for the majority of Louisiana is 4.0 to 4.5 kilowatt hours per square meter per day (kWh/m²/day), and for the coastline and New Orleans area, 4.5 to 5.0 kWh/m²/day (NREL 2012a). For CSP generating facilities, the minimum viable level is 6.75 kWh/m²/day (Blair et al. 2006). Such a level of direct solar radiation is not found in the Entergy Louisiana, LLC service territory (NREL 2012a). The PV solar resource for Louisiana and

much of the Entergy territory is estimated by NREL to be higher, 5.0 to 5.5 kWh/m²/day (NREL 2012b).

Due to the amount of solar generating capacity needed to replace WF3's base-load generation, the modest levels of solar radiation in Louisiana and the lower efficiencies in producing electricity from solar power versus nuclear power substantially increase land requirements beyond those of other alternatives considered. A recent NREL study for the United States indicated current estimates of the amount of land required for utility-scale solar generation. Direct land use requirements for PV installations range from 1.6 to 5.8 acres/gigawatt hours per year (GWh/yr), with a generation-weighted average of 3.1 acres/GWh/yr (NREL 2013). Direct land use intensity requirements for CSP installations range from 1.5 to 5.3 acres/GWh/yr, with a generation-weighted average of 2.7 acres/GWh/yr (NREL 2013). Based on these estimates, land use for replacement of WF3's 1,188 MWe (10,407 GWh/yr) could be between 16,700 and 60,400 acres of new land disturbance for PV generation, and between 15,600 and 55,200 acres of new land disturbance for CSP power generation. Depending on the location of the solar generation, this amount of land disturbance could result in MODERATE to LARGE impacts on affected resources (terrestrial habitat, land use, and aesthetic impacts).

Because CSP is a thermoelectric technology, like a fossil fuel-fired or nuclear power plant, a cooling system would be required. A CSP plant uses 760 to 920 gallons/MWh (AWR 2008), comparable with a nuclear plant with wet cooling towers which uses 720 gallons/MWh (NEI 2013). More recently, dry cooling technology using air cooling has been deployed (NREL 2014). Thus, water consumption for cooling as well as other water requirements for the CSP facility would result in SMALL water use impacts.

Solar power is an intermittent power source because direct or indirect solar radiation is not available throughout each day. Therefore, a solar facility would need to be coupled with energy storage to overcome its inherent intermittency. The storage facility would further increase land requirements and other environmental impacts.

Given the relatively modest solar radiation in Louisiana, increased land requirements for a utility-scale facility to provide replacement power, intermittency of the power source, and need for energy storage, solar is not considered a reasonable alternative for replacement of WF3's base-load generation.

7.1.2.2.3 Hydropower

Recent studies funded by the DOE reviewed the potential for new hydropower resources in the United States (ORNL 2012; ORNL 2014). The first study reviewed existing unpowered dams in the United States for their potential as hydropower sources. Louisiana was determined to have the potential for approximately 847 MW (ORNL 2012). Therefore, powering all the identified dams would not provide replacement generating capacity for WF3.

The second study reviewed the hydropower potential of undeveloped stream reaches. The median generating capacity of the undeveloped stream reaches in the LMR region is 3 MW in Louisiana, and southwest Mississippi had potential resources only up to the 10-MW range

(ORNL 2014, Section 11.3). The downstream area of the LMR tends to be larger in flow but lower in hydraulic head, requiring low-head technology that is generally more expensive and less efficient. For development of these streams, land would have to be inundated to provide water storage capacity with the median inundation being 2,000 acres per stream. Replacement of WF3's base-load generating capacity would therefore require flooding a substantial amount of land. Also, instream navigation is a more important function than hydropower in this region. (ORNL 2014, Section 11.1) In addition, protected species are found in many of these streams (ORNL 2014, Section 11.4).

Due to the large land use requirements of undeveloped stream reaches to provide water storage capacity as well as the development of transmission corridors for both unpowered existing dams and newly developed stream reaches, and related environmental and ecological resource impacts associated with siting hydroelectric facilities with cumulative capacity to replace WF3, it can be concluded that local hydropower alone is not a reasonable alternative to the renewal of the WF3 OL. Any attempts to site hydroelectric facilities with cumulative capacity to replace WF3 would result in LARGE environmental impacts.

7.1.2.2.4 Geothermal

Geothermal energy facilities have demonstrated capacity factors of 90 to 98 percent, making geothermal energy clearly eligible as a source of base-load electric power (NRC 2013b, Section 2.3.3.2). However, as with other renewable energy technologies, the ultimate feasibility of geothermal energy serving as a base-load power replacement for WF3 depends on the quality and accessibility of geothermal resources within or proximate to the region of interest—in this case, the Entergy Louisiana, LLC or SERC region. Geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii, where hydrothermal reservoirs are prevalent (NRC 2013b, Section 2.3.3.2; NREL 2011b, Figure 22). Therefore, geothermal resources are not considered a reasonable alternative for the replacement of WF3's base-load generation.

7.1.2.2.5 Wood Waste

Use of wood waste as a fuel for generating electricity depends on supply volume and proximity to the site of the proposed project. The volume of the supply of fuel would be dependent on the volume of wood waste from lumber or other wood product production to avoid harvesting timber just for fuel. NREL profiled the supply of forest residue in the United States using 2007 data collected by the U.S. Forest Service. Specifically, NREL reported that some parishes within a 50-mile radius of WF3 have an annual supply of 50,000 to 100,000 dry tonnes of forest residue (NREL 2009a). This amount of forest residue would supply an estimated 30 to 60 MW based on 8,570 British thermal units per pound (Btu/lb) (dry) (ENERCON 2015b). It would require the total supply from many parishes within a 50-mile radius of WF3 to provide the feedstock for replacement power for WF3. The feedstock would also have to be sustained for 20 years to serve as a replacement alternative for WF3, which would result in ecological impacts due to large-scale timber harvesting. Like coal-fired plants, wood-waste plants also require large land areas for fuel storage and processing, and they involve the same type of combustion equipment.

To replace the base-load generating capacity of WF3, several wood waste plants would be required. Therefore, development of wood waste-fired plants is not considered a reasonable alternative as a replacement for WF3's base-load generation. However, biomass plants are a component of the combination alternative included as a reasonable alternative for replacing WF3's base-load generation.

7.1.2.2.6 Municipal Solid Waste

As with wood waste, MSW as a fuel is dependent on supply. The proximity of Louisiana's large cities of New Orleans and Baton Rouge provide the potential for a steady and sustainable supply of MSW. Louisiana does not have any active MSW-fired generating plants (ERC 2014). As of 2014, there are 84 waste-to-energy plants in the United States, 80 of which are currently operating and 4 that are currently inactive but may return to active service at a future date. These waste-to-energy plants have an aggregate generating capacity of 2,769 MWe, with the largest plant having a gross generating capacity of 93 MWe. In addition, a new plant with the capacity of 96 MWe is scheduled to open in 2015. (ERC 2014) More than 13 of the largest-sized plants would be necessary to provide the same level of output as WF3.

The average air emission rates in the United States from MSW-fired generation are 1.2 lbs/MWh of SO₂ and 6.7 lbs/MWh of nitrogen oxides (NO_x) (EPA 2013). MSW combustion results in approximately 1,016 pounds of carbon dioxide (CO₂) per MWh. The toxics generated by MSW combustion facilities are tightly regulated by the maximum achievable control technology (MACT) standards under the CAA, and a variety of air pollution control technologies are used to reduce toxic air pollutants from MSW-fired power plants. (EPA 2014c)

The overall level of impact from construction of a waste-fired plant would be approximately the same as that for a coal-fired power plant. In addition, waste-fired plants have the same or greater operational impacts as coal-fired technologies (including impacts on the aquatic environment, air, and waste disposal). (NRC 2013c, Section 9.2.3.7)

Given limitations in generating capacity due to supply, land use impacts, and operational air emission impacts, Entergy does not consider an MSW-fired plant as a reasonable replacement alternative for WF3's base-load generation. However, biomass plants are a component of the combination alternative included as a reasonable alternative for replacing WF3's base-load generation.

7.1.2.2.7 Other Biomass-Derived Fuels

Biomass fuels other than wood and MSW include waste sources such as crop residue, methane from animal facilities and wastewater treatment facilities, as well as energy crops such as switchgrass cultivated and harvested for use as a biofuel. These energy sources have comparable or less energy content than wood waste (EPA 2007), as discussed above. Availability of crop residue in the parishes near WF3 was reported by NREL (2009b) as predominantly 100,000 to 200,000 dry tonnes per year, which while more plentiful than wood waste, would still require use of all the feedstock in multiple parishes. The feedstock would also have to be sustained for 20 years to serve as a replacement for WF3's base-load generation.

Generally, biomass-fueled facilities are small-scale facilities, and co-firing with other fuels such as coal is common. As with wood waste, many multiple biomass-fueled plants would be required to replace the generating capacity of WF3 resulting in impacts on land use and air quality as a result of hazardous air pollutant (HAP) emissions. Therefore, development of biomass-derived fuel-fired plants is not considered a reasonable replacement alternative for WF3's base-load generation. However, biomass plants are a component of the combination alternative included as a reasonable alternative for replacing WF3's base-load generation.

7.1.2.2.8 Fuel Cells

Fuel cells as an alternative source for generating base-load electricity are not presently economically or technologically competitive with other alternatives. This non-competitiveness is due to various challenges including the cost for commercial applications and technology challenges for reliability and durability of fuel cells, along with improvements in fuel processing systems to convert fuel such as natural gas to hydrogen (DOE 2013; DOE 2014). The EIA projects that fuel cells may cost \$7,108 per installed kW (total overnight capital costs, 2012 dollars), which is higher than most other technologies analyzed, and fuel cell units are generally small in scale (EIA's analysis was based on a 10-MWe model) (EIA 2013b, page 6). The world's largest fuel cell plant, a 59-MWe plant located in South Korea, began operations in 2014 (National Geographic 2014). Using the world's largest plant as a model, WF3 replacement generating capacity would require approximately 21 plants. It would be extremely costly to replace the base-load generation provided by WF3. Given the immature status of fuel cell technology and high cost, fuel cells are not considered a reasonable alternative for replacing WF3's base-load generating capacity.

7.1.2.2.9 Oil

The variable costs of oil-fired generation tend to be greater than those of the nuclear or coal-fired operations, and oil-fired generation tends to have greater environmental impacts than natural gas-fired generation. For example, in addition to carbon dioxide emissions, oil-fired generation would also emit HAPs. Based on existing and pending air emission regulations for HAPs (77 FR 9304), and carbon dioxide, including carbon capture requirements (79 FR 1430), and the fact that oil-fired generation is one of the largest energy-related contributors to CO₂ emissions in the world, Entergy considers oil an unreasonable alternative to replace WF3's base-load generation, nor is it an environmentally preferred alternative.

7.1.2.2.10 Ocean Wave and Current Energy

The Electric Power Research Institute assessed the potential for wave energy along the continental shelf of the United States and estimated the available wave energy resource for Louisiana to be 29 terrawatt hours per year along the outer shelf, and 19 terrawatt hours per year along the inner shelf (EPRI 2011, Table 4-6). There are modest wave energy resources available off the Gulf Coast. However, wave energy technology is still in the early stages of development. The potential for wave and ocean energy is limited because the Gulf of Mexico is shallow and semi-enclosed (TCPA 2008, Chapter 20). Because most technologies are relatively undeveloped (and none are developed on the scale of WF3), and because the Gulf of Mexico

has limited potential for wave and ocean energy, Entergy does not consider wave and ocean energy as a reasonable alternative to the renewal of the WF3 OL.

7.1.2.2.11 Coal-Fired Integrated Gasification Combined-Cycle

IGCC is a technology for generating electricity with coal that combines modern coal gasification technology with both gas turbine and steam turbine power generation. Gasifiers, similar to those used in oil refineries, use heat pressure and steam to pyrolyze (thermally reform complex organic molecules without oxidation) coal to produce synthesis gases (generically referred to as syngas) typically composed of CO, hydrogen, and other flammable constituents. After processing to remove contaminants and produce various liquid chemicals, the syngas is combusted in a combustion turbine to produce electric power. Separating the CO₂ from the syngas before combustion is also possible. Latent heat is recovered both from the syngas as it exits the gasifier and from the combustion gases exiting the combustion turbine and directed to a heat recovery steam generator feeding a conventional Rankine cycle steam turbine generator to produce additional amounts of electricity. Emissions of criteria pollutants would likely be slightly higher than those from the NGCC plant alternative, but significantly lower than those from the SCPC plant alternative. Depending on the gasification technology employed, an IGCC plant would use less water than a SCPC plant but slightly more than an NGCC plant. Long-term maintenance costs of this relatively complex technology would likely be greater than those for a similarly sized SCPC or NGCC plant. (NRC 2014d, Section 8.6.13)

Operating at higher thermal efficiencies than SCPC-fired boilers, IGCC plants can produce electrical power with fewer air pollutants and solid wastes than SCPC-fired boilers. Currently, there is an operating IGCC plant at Edwardsport, Indiana, and another one being constructed in Mississippi. IGCC technology may become more commonplace in the future due to potential environmental regulations mandating carbon capture and storage (CCS) system as the best method of emission reduction. CCS is less expensive to operate with IGCC than SCPC primarily because the CO₂ is separated from the syngas before combustion, whereas with SCPC, the CO₂ is separated after combustion (NRC 2014d, Section 8.6.13).

To date, however, IGCC technologies have had limited application and have been plagued with operational problems such that their effective, long-term capacity factors are often not high enough for them to reliably serve as base-load units. Although IGCC technology may become more commonplace in the future, current operational problems that compromise reliability result in the dismissal of this technology as a reasonable alternative (NRC 2015c, Section 2.3.11) to the renewal of the WF3 OL.

7.1.3 Environmental Impacts of Alternatives

Each of the alternatives considered as reasonable (Section 7.1.1) are discussed below. The generation alternatives are sized to provide replacement of the approximately 1,188 net MWe base-load power generated by WF3 in order to compare the environmental impacts of the alternatives to the proposed action, which is renewal of the WF3 OL.

7.1.3.1 Natural Gas-Fired Generation

As discussed in [Section 7.1.1.1](#), the natural gas-fired alternative would be an NGCC plant, consisting of multiple combustion turbines, heat recovery steam generator, and a steam turbine generator assembled in appropriate power-train configurations to produce net electrical power virtually equivalent to the 1,188 net MWe generated by WF3. Based on a capacity factor of 87 percent ([EIA 2013a](#)), the alternative is scoped as a 1,366-MWe plant to provide equivalent generating capacity to replace WF3's base-load generation. The NGCC plant alternative would be located on the Entergy Louisiana, LLC property on previously disturbed land. As previously discussed in [Section 3.0](#), WF3 is located on approximately 3,560 acres of Entergy Louisiana, LLC owned land. Waterford 1 and 2 (oil/gas-fired generating plants) and Waterford 4 (oil-fired peaking plant) are also located on this same Entergy Louisiana, LLC property. The environmental impacts associated with constructing and operating the NGCC plant alternative assumes (1) closed-cycle cooling with mechanical draft cooling towers would be utilized, (2) source of cooling water would be the Mississippi River, (3) existing transmission line infrastructure is adequate, and (4) existing intake and discharge structures can be utilized with some modifications.

7.1.3.1.1 Land Use and Visual Resources

Land Use

Approximately 59 acres of land would be required to construct the NGCC plant alternative ([ENERCON 2015b](#)), based on 4.94E-06 acres per MWh (adapted from [NETL 2010a](#), Figure 3-23). Due to the acreage available on the Entergy Louisiana, LLC property, encroachment into wetlands from construction activities is not anticipated; therefore, there would be no associated impacts on wetlands. The natural gas pipeline closest to the Entergy Louisiana, LLC property that has adequate supply to operate the hypothetical NGCC plant alternative is the TETCO pipeline, approximately 6–7 miles south of WF3 on the same side of the Mississippi River ([Entergy 2015o](#)). Therefore, a new pipeline segment with an associated 100-foot-wide ROW connecting the site to the existing natural gas distribution infrastructure would be needed. However, collocating a new pipeline within an existing ROW would minimize land use impacts. Because the NGCC plant alternative would be built at an existing power plant site on previously disturbed land and the potential exists that the new pipeline could be collocated within an existing ROW, construction-related impacts on land use under the NGCC plant alternative are assumed to be SMALL.

In addition to onsite land requirements, offsite land is typically required for natural gas wells and collection stations during operations. The 1996 GEIS estimated that approximately 3,600 acres would be needed for a natural gas well field of sufficient size to support a 1000-MWe gas-fired plant ([NRC 1996](#), Section 8.3.10). Therefore, for a 1,366-MWe NGCC plant alternative, approximately 4,920 acres could be needed for the natural gas well field. However, no new gas wells or collection wells would be needed, because there is an abundance of gas supply being transported from the northeast United States through the TETCO pipeline to the Gulf area ([Entergy 2015o](#)). Therefore, Entergy assumes that existing gas supply can support operations of

the NGCC plant alternative on the Entergy Louisiana, LLC property, and no additional offsite land would be required. Overall, operations-related land use impacts under the NGCC plant alternative are anticipated to be SMALL.

Visual Resources

During construction, all clearing and excavation would occur on the Entergy Louisiana, LLC property, which already hosts four power plants and would be visible off site. Because the existing site already appears industrial, construction of the NGCC plant alternative would appear similar to other ongoing onsite activities. Therefore, construction-related aesthetic impacts under the NGCC plant alternative would be SMALL.

During operations, the tallest structures at the NGCC plant alternative would include the exhaust stacks and mechanical draft cooling towers. The facility would be visible off site during daylight hours. The addition of mechanical draft cooling towers and associated condensate plumes could add to the visual impact. The power block of the NGCC plant alternative would look similar to the Waterford 1, 2, and 4 power plants already existing on the Entergy Louisiana, LLC property. Because the Entergy Louisiana, LLC property is already aesthetically altered by the presence of existing power plants and other nearby industrial facilities, the new NGCC plant alternative would blend in with the industrial surroundings. Therefore, operations-related aesthetic impacts under the NGCC plant alternative would be SMALL.

7.1.3.1.2 Air Quality

Construction of the NGCC plant alternative would result in the release of various criteria pollutants such as CO, NO_x, sulfur oxide (SO_x), particulate matter, and volatile organic compounds (VOCs), as well as various GHGs from the operation of internal combustion engines in construction vehicles, equipment, delivery vehicles, and vehicles used by the commuting construction workforce. VOC releases will also result from the onsite storage and dispensing of vehicle and equipment fuels. Onsite activities would also generate fugitive dust. These impacts would be intermittent and short-lived, however, and adherence to well-developed and well-understood construction BMPs, such as development and execution of a fugitive dust control plan, would mitigate such impacts. Air emissions would be intermittent and vary based on the level and duration of a specific activity throughout the construction phase. Gas-fired power plants are constructed relatively quickly. Therefore, construction-related impacts on air quality under the NGCC plant alternative would be of relatively short duration and SMALL.

During operations, the NGCC plant alternative would be equipped with air pollution controls to ensure compliance with air quality regulations, minimizing emissions of criteria air pollutants. The facility would consume approximately 94 billion cubic feet of natural gas annually. Emission estimates for the NGCC, based on EPA emission factors, are shown in [Table 7.1-1](#).

A new NGCC plant would qualify as a new major source of criteria pollutants and would be subjected to Prevention of Significant Deterioration (PSD) of Air Quality review under CAA requirements and Louisiana state regulations. As such, it would need to comply with the New Source Performance Standard for NGCC plants set forth in 40 CFR Part 60 Subpart Da:

particulate matter and opacity [40 CFR 60.42Da]; SO₂ [40 CFR 60.43Da]; and NO_x [40 CFR 60.44Da]. A new NGCC plant would also qualify as a major source because its potential to emit is greater than 100 tons/year of criteria pollutants and its CO₂ is greater than 75,000 tons/year, and would be required to secure a Title V operating permit. (NRC 2013c, Section 9.2.2.2)

In addition, an NGCC plant would be subject to the EPA's National Emission Standards for Hazardous Air Pollutants (HAPs) for Stationary Combustion Turbines [40 CFR 63, Subpart YYYYY], if the NGCC plant was a major source of HAPs (having the potential to emit 10 tons/year or more of any single HAP or 25 tons/year or more of any combination of HAPs [40 CFR 63.6085(b)]). (NRC 2013c, Section 9.2.2.2)

A new NGCC plant would also have to comply with Title IV of the CAA [42 U.S.C. 7651] reduction requirements for SO₂ and NO_x, which are the main precursors of acid rain and the major causes of reduced visibility. Title IV establishes maximum SO₂ and NO_x emission rates from the existing plants and a system of SO₂ emission allowances that can be used, sold, or saved for future use by new plants. (NRC 2014d, Section 8.1.1)

More recently, the EPA has promulgated additional rules and requirements that apply to certain fossil fuel-based power plants, such as NGCC plant generation. The Cross-State Air Pollution Rule and the PSD and Title V Greenhouse Gas Tailoring Rule impose several additional standards to limit ozone, particulate, and GHG emissions from fossil fuel-based power plants. A new NGCC plant would be subject to these additional rules and regulations. (NRC 2014d, Section 8.1.1)

As noted above, a new NGCC plant would be subject to several EPA regulations designed to minimize air quality impacts from operations. Nevertheless, a new NGCC plant would be a major source of criteria pollutants and GHGs. Therefore, the overall operations-related impacts on air quality under the NGCC plant alternative would be MODERATE.

7.1.3.1.3 Noise

During construction, noise would increase with the operation of vehicles, earthmoving equipment, materials-handling equipment, impact equipment, and other stationary equipment (such as pumps and compressors), and the increase of human activity. The site on which the NGCC plant alternative would be constructed has been zoned as an M-2 Heavy Manufacturing Zoning District. This zoning designation requires a minimum 2,000-foot buffer from the nearest residential and commercial district, or located a lesser distance if clearly dictated safe by industry standards and approved by the local Board of Adjustments. Therefore, any site plan for an NGCC plant alternative would comply with this buffer requirement. As discussed in Sections 3.0.3 and 3.0.4, the closest sensitive receptors to WF3 are residences located approximately 0.9 miles to the northeast, east-northeast, northwest, and west-northwest, and two parks (Killona and Montz) approximately 1 mile northwest and 1 mile east-northeast, respectively, of WF3. Because noise activities associated with construction are intermittent and last only through the duration of construction (approximately 3 years), construction-related noise impacts under the NGCC plant alternative are anticipated to be effectively managed and kept SMALL.

Noise impacts from operations would include cooling towers (water pumps, cascading water, or fans), transformers, turbines, pumps, compressors, exhaust stack, the combustion inlet filter house, condenser fans, high-pressure steam piping, and vehicles. Entergy does not expect noise impacts from the operation of an NGCC plant alternative to be any greater than those currently associated with WF3. Therefore, operations-related noise impacts under the NGCC plant alternative are anticipated to be SMALL.

7.1.3.1.4 Geology and Soils

During construction, sources of aggregate material, such as crushed stone and sand and gravel, would be required to construct buildings, foundations, roads, and parking lots. It is presumed that these resources would likely be obtained from commercial suppliers using local or regional sources. Land clearing during construction and the installation of power plant structures and impervious surfaces, and a new natural gas pipeline would expose soils to erosion and alter surface drainage. However, any ground disturbance of one or more acres would require that a construction stormwater permit be obtained from the LDEQ. The construction stormwater permit specifies BMPs to reduce erosion caused by stormwater runoff, thereby minimizing the risk of pollution from soil erosion and sediment, and potentially from other pollutants the stormwater may contact. Removed soils and any excavated materials would be stored onsite for redistribution such as for backfill at the end of construction. Construction activities would be temporary and localized. Therefore, construction-related impacts under the NGCC plant alternative on geology and soils would be minimized and SMALL.

Land disturbance during operations would also be conducted in accordance with applicable permits and site procedures and plans. The NGCC plant alternative would also have to comply with stormwater permitting requirements to develop and maintain a SWPPP. The SWPPP identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater, such as erosion, and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. Therefore, operations-related impacts on geology and soils under the NGCC plant alternative would also be SMALL.

7.1.3.1.5 Hydrology (Surface Water and Groundwater)

Surface Water

The NGCC plant alternative would occupy a much smaller footprint (i.e., about 59 acres) than the existing WF3 plant and infrastructure, which would result in less extensive excavation and earthwork. Dewatering of excavations, if necessary, is unlikely to consume enough water to affect surface water bodies.

For the NGCC plant alternative, Entergy assumes that WF3's existing intake and discharge infrastructure would be modified to maximize use of existing facilities. This would reduce construction-related impacts on surface water quality. Dredge-and-fill operations would be conducted under a USACE permit and State-equivalent permits requiring the implementation of BMPs to minimize impacts. Construction activities associated with this alternative will alter onsite surface water drainage features. Some temporary impacts on surface water quality may result

from increased sediment loading and from any pollutants in stormwater runoff from disturbed areas, from excavation, and dredge-and-fill activities. Stormwater runoff from construction areas, as well as spills and leaks from construction equipment, could potentially affect downstream surface water quality. Nevertheless, for this alternative, appropriate soil erosion and sediment control measures would be observed. Application of BMPs in accordance with an LDEQ stormwater construction permit, including appropriate waste management, water discharge, SWPPP, and spill prevention practices, would prevent or minimize surface water quality impacts during construction. Therefore, construction-related impacts on surface water use and quality under the NGCC plant alternative are anticipated to be SMALL.

Depending on the path of any required new gas pipelines to service the NGCC plant alternative, some stream crossings could be necessary. However, because of the short-term nature of any required dredge-and-fill and stream-crossing activities, the hydrologic alterations and sedimentation would be localized, and water-quality impacts would be temporary. In addition, modern pipeline construction techniques, such as horizontal directional drilling, would further minimize the potential for water-quality impacts on the affected streams. Such activities, including any dredge-and-fill operations, would be conducted under a USACE permit and State-equivalent permits for dredge-and-fill and stream encroachment, requiring the implementation of BMPs to minimize impacts. Therefore, construction-related impacts on surface water use and quality are anticipated to be SMALL.

During operations, the NGCC plant alternative would use mechanical draft cooling towers with makeup water supplied by the Mississippi River. Water withdrawals would be a fraction of that required by WF3's once-through cooling system, and water consumption as a result of cooling tower evaporative losses would be insignificant compared to the volume of water flowing in the Mississippi River. Cooling water treatment additives would essentially be the same as those for WF3. While the discharge water quality would be chemically similar, the discharge volume from the closed-cycle NGCC plant alternative would be a small fraction of the cooling water discharge and related effluents discharged from WF3's once-through cooling system. However, like WF3, cooling water discharges would be regulated under an LPDES permit to protect water quality. Therefore, operations-related impacts on surface water use and quality under the NGCC plant alternative would be SMALL.

Groundwater

Entergy assumes that construction water would be obtained from the St. Charles Parish water system whose source of water is the Mississippi River, and who currently supplies water to WF3. Construction water would be required for uses such as potable and sanitary use by the construction workforce and for concrete production, equipment washdown, dust suppression, and soil compaction.

Foundation excavations may intrude on groundwater zones and require dewatering during construction. Discharge of water removed by dewatering activities would require an LPDES permit and compliance with any conditions, minimizing impacts on receiving waters and soils. The potential impacts on groundwater from dewatering activities could stem from reductions in

quantity and quality. However, as discussed in [Section 3.5.2](#), shallow and deeper aquifers underlie the site, but groundwater usage is limited and is mainly for industrial purposes. Groundwater could also be affected by runoff that could contain contaminants; however, compliance with appropriate waste management practices, construction stormwater permit and pollution prevention requirements, and spill prevention practices, would prevent or minimize such adverse impacts. Therefore, construction-related impacts on groundwater use and quality under the NGCC plant alternative would be SMALL.

During operations, it is assumed that the St. Charles Parish water system would continue to supply potable water. Continuing dewatering activities, if necessary, would be regulated under an LPDES permit. In addition, appropriate waste management, SWPPP, and spill prevention practices, would prevent or minimize groundwater quality impacts. Therefore, operations-related impacts on groundwater use and quality under the NGCC plant alternative would be SMALL.

7.1.3.1.6 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

Terrestrial ecology impacts from construction of the NGCC plant alternative would primarily occur from land disturbance. As discussed in [Section 7.1.3.1.1](#), the NGCC plant alternative would require approximately 59 acres of land on site. The site has available acreage that is already disturbed and would not encroach on the wetlands of the site, which are primarily found south of LA-3127. Furthermore, the site is an industrial site with existing industry onsite (Waterford 1, 2, and 4), and industrial and transportation corridors are adjacent. Also as discussed in [Section 7.1.3.1.1](#), siting any new gas pipeline along existing utility corridors would minimize impacts, and existing gas supply from the TETCO pipeline is assumed to be adequate for supporting operations of the NGCC plant alternative.

Plant communities in the proposed construction footprint would be cleared to accommodate the new plant site and gas pipeline, and wildlife would relocate by their own means. Erosion and sedimentation, fugitive dust, and construction debris impacts would be minor with implementation of appropriate BMPs. Disturbed areas would be revegetated with native and non-invasive flora species, as appropriate. Because WF3 is located in a heavily industrialized area, wildlife species have most likely acclimated to noise associated with activities in this area. Therefore, construction-related impacts on terrestrial resources under the NGCC plant alternative are anticipated to be SMALL.

The impacts on terrestrial resources from operation of the NGCC plant alternative would be similar to the continued operation of WF3 with the exception of impacts due to the operation of the mechanical draft cooling towers. Operation of the cooling towers would cause some deposition of dissolved solids on surrounding vegetation and soil from cooling tower drift. Other impacts such as fogging and shadowing, etc. would also occur. Cooling tower operational noise could also impact terrestrial wildlife, and there is the potential for bird collisions. However, these impacts would be similar to existing nuclear plants with cooling towers, which the NRC determined in the GEIS to be SMALL ([NRC 2013b](#), Table 2.1-1). Therefore, overall operations-

related impacts on terrestrial resources under the NGCC plant alternative are anticipated to be SMALL.

Aquatic

Impacts on aquatic ecosystems during construction would be minimal, due to the relatively small amount of water required and controls on the quality of surface water discharges imposed by a construction stormwater permit and USACE permit. The construction stormwater permit would contain control measures to minimize the flow of disturbed soils into aquatic features while the USACE permit would require BMPs for in-water work to minimize sedimentation and erosion. Therefore, construction-related impacts on aquatic ecological resources under the NGCC plant alternative are anticipated to be SMALL.

During operations, the NGCC plant alternative would require less cooling water to be withdrawn from the Mississippi River than is required for WF3. Because of the lower withdrawal rates, the number of fish and other aquatic resources affected by cooling-water intake and discharge operations, such as entrainment, impingement, and thermal stress, would be less for the NGCC plant alternative than for those associated with license renewal. The cooling system for the NGCC plant alternative would have similar chemical discharges as WF3 which would be regulated by an LPDES permit, but the air emissions from the NGCC plant alternative would contain pollutants that could settle onto the river surface and introduce a new source of pollutants. However, the flow of the Mississippi River would likely dissipate and dilute the concentration of pollutants, resulting in minimal exposure to aquatic biota. Therefore, operations-related impacts on aquatic ecological resources under the NGCC plant alternative are anticipated to be SMALL.

Special Status Species

Unlike the proposed action, no-action alternative, and new nuclear alternative, the NRC does not license NGCC facilities, and the NRC would not be responsible for initiating Section 7 consultation if listed species or habitats might be adversely affected under this alternative. The facilities themselves would be responsible for protecting listed species because the ESA forbids the taking of a listed species.

However, as discussed in [Section 3.6.11](#), no suitable habitat was identified on the Entergy Louisiana, LLC property for any of the federally listed species in St. Charles Parish during an October 2014 threatened and endangered species habitat survey, and no federally listed species were identified as being present on site. Although suitable habitat for three state-listed species was identified in undisturbed portions of the Entergy Louisiana, LLC property, the survey did not identify any state-listed species as being present on the Entergy Louisiana, LLC property. Because the site has available acreage that is already disturbed, as discussed in [Section 7.1.3.1.6](#), construction- and operations-related impacts on special status species under the NGCC plant alternative are anticipated to have no effect. Based on consultation with the NMFS, no EFH has been designated in the Mississippi River in the vicinity of WF3 ([Attachment B](#)). Construction activities associated with the new gas pipeline would be subject to LDEQ construction stormwater permitting requirements, which would consider protection of special

status species and associated designated habitats. Therefore, construction- and operations-related impacts on special status species under the NGCC plant alternative would have no effect.

7.1.3.1.7 Historic and Cultural Resources

As discussed in [Section 7.1.3.1.1](#), the NGCC plant alternative would require approximately 59 acres of land on the Entergy Louisiana, LLC property and, as discussed in [Section 7.1.3.1.6](#), the site has available acreage that is already disturbed. The cultural resources on site and in the vicinity are detailed in [Section 3.7](#). As discussed in [Section 3.7](#), the Waterford Plantation is the only cultural resources site on the Entergy Louisiana, LLC property eligible for listing on the NRHP. The Killona Plantation and possibly a portion of the Providence Plantation are also located on the Entergy Louisiana, LLC property eligible for listing on the NRHP. Therefore, any construction activities would either need to avoid these areas, or in the case of the Killona and Providence plantations, surveys would need to be conducted to determine their NRHP eligibility. However, because portions of the Entergy Louisiana, LLC property have already been previously identified as not containing significant historic and cultural resources, use of these areas for an NGCC plant alternative would have no effect on historic and cultural resources. As previously discussed in [Section 7.1.3.1.1](#), a new gas pipeline would have to be installed to connect the hypothetical NGCC plant alternative to the gas infrastructure. However, this new pipeline could be collocated within an existing ROW, or if not located within an existing ROW, the area could be surveyed to identify and record historic and cultural resources. No offsite land would be needed for gas wells and collection wells, because the TETCO gas pipeline is assumed to be adequate for supporting operations of the NGCC plant alternative.

Given that the preference is to use previously surveyed and/or disturbed areas, avoidance of significant historic and cultural resources should be possible and effectively managed under current laws and regulations. Therefore, the construction and operational impacts on historic and cultural resources under the NGCC plant alternative is projected to have no adverse effect.

7.1.3.1.8 Socioeconomics

Socioeconomic Issues Other than Transportation

Two types of jobs would be created by this alternative: (1) construction jobs, which are transient, short in duration, and less likely to have a long-term socioeconomic impact; and (2) power plant operations jobs, which have the greater potential for permanent, long-term socioeconomic impacts. Workforce requirements for the construction and operation of the NGCC plant alternative were evaluated to measure their possible effects on current socioeconomic conditions.

Scaling from the NRC's 1996 GEIS ([NRC 1996](#), Table 8.1) estimate of 1,200 workers needed to construct a 1,000-MWe natural gas plant, the NGCC plant alternative would have a peak construction workforce of approximately 1,640. Given the proximity of New Orleans and Baton Rouge, the majority of a construction workforce would be expected to reside within the region (50-mile radius of WF3). It is expected that the remainder of the construction-related workforce would in-migrate from outside the region in the same residential distribution as the current WF3

workforce. It is not expected that many in-migrating construction workers would permanently relocate to the region, so any socioeconomic effect induced by the in-migrating workers would be temporary. Therefore, construction-related socioeconomic impacts under the NGCC plant alternative are anticipated to be SMALL.

Scaling from the 1996 GEIS (NRC 1996, Table 8.2) estimate of 150 workers needed for operations, the operations workforce under the NGCC plant alternative would be approximately 205, significantly smaller than the WF3 operations workforce of 641. The NGCC plant alternative workforce would continue to contribute beneficial socioeconomic impacts on the area albeit on a smaller scale as compared to WF3's current contribution and, as a smaller workforce, would have less of a demand for community services.

This alternative would also result in the loss of jobs at WF3 and a corresponding reduction in purchasing activity and revenue contributions to the regional economy. However, the reduction in jobs at WF3 would most likely occur gradually as Entergy transitions from reactor operations to decommissioning. Socioeconomic impacts may not be noticeable in local communities, because this transition may occur over a long period of time. Although the NGCC plant alternative would be located in an area with other existing industries, it is uncertain what the loss of jobs at WF3 and potentially lower property tax payments would mean to the local community. Therefore, socioeconomic impacts during the operations period under the NGCC plant alternative could range from SMALL to MODERATE.

Transportation

A network of interstate highways surrounds the Entergy Louisiana, LLC property, with LA-18 providing access to WF3. This transportation network would be used by the commuting workforce and for delivery of needed construction materials. Larger components for the NGCC plant would likely arrive by barge or rail, which would avoid potential traffic congestion and stoppages for transport of large components. The traffic capacity of these roads and the ability to stagger workforce shifts, if needed, would minimize traffic congestion; however, the construction-related impacts under the NGCC plant alternative could still be MODERATE.

Traffic-related transportation impacts would be greatly reduced after construction of the NGCC plant alternative. Transportation impacts would include daily commuting by the operating workforce, equipment and materials deliveries, and the removal of commercial waste material to offsite disposal or recycling facilities by truck. The operations workforce of approximately 210 likely would not be noticeable relative to total traffic volumes on local roadways. Because fuel is transported by pipeline, the transportation infrastructure would experience little to no increased traffic from plant operations. Overall, given the relatively small operations workforce, operations-related transportation impacts under the NGCC plant alternative would be SMALL.

7.1.3.1.9 Human Health

Impacts on human health from construction of the NGCC plant alternative, including the construction of a new gas pipeline, would be similar to effects associated with the construction of any major industrial facility. Compliance with OSHA worker protection rules would control those

impacts on workers at acceptable levels. The radiological human health impact on construction workers due to the proximity of WF3 still operating at that time would also be SMALL due to compliance with the NRC regulations and adherence to ALARA principles. The NRC reviewed radiation exposures to plant workers in its license renewal GEIS and found the impacts to be SMALL (NRC 2013b, Table 2.1-1). Impacts from construction on the general public would be minimal because crews would limit access to active construction areas to authorized individuals. Therefore, construction-related impacts on human health under the NGCC plant alternative would be SMALL.

During the operations period, the NGCC plant alternative would emit criteria air pollutants (Table 7.1-1). The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contribute to health risk. Regulatory agencies, including the EPA and State agencies, base air emission standards and requirements on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. Given the regulatory oversight exercised by the EPA and State agencies, human health impacts from criteria air pollutant emissions under the NGCC plant alternative would be SMALL. Operations would also be conducted in accordance with OSHA worker protection rules and NRC regulations, minimizing exposures and hazards. Based on the above, operations-related impacts on human health under the NGCC plant alternative would be SMALL.

7.1.3.1.10 Environmental Justice

Potential impacts on minority and low-income populations from the construction of the NGCC plant alternative would mostly consist of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during construction would be short-term and managed to limit offsite impacts. Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic. However, because of the temporary nature of construction, these effects are not likely to be high and adverse and would be contained to a limited time period during certain hours of the day. Increased demand for rental housing during construction could cause rental costs to rise disproportionately, affecting low-income populations residing in the vicinity of WF3 who rely on inexpensive housing. However, given the proximity of the New Orleans and Baton Rouge metropolitan areas, the majority of workers would be expected to commute to the construction site, thereby reducing the need for rental housing.

Based on this information and the analysis of human health and environmental impacts presented in Section 7.1.3.1 of this ER, the construction and operation of an NGCC plant alternative would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of WF3.

7.1.3.1.11 Waste Management

Sanitary wastes resulting from both the support of the construction crew and industrial wastes (some hazardous) would be generated during construction. Construction-related wastes are expected to be properly characterized and initially managed on site, and eventually removed to

properly permitted offsite treatment or disposal facilities. Waste impacts from construction are expected to be SMALL.

During operation of the NGCC plant alternative, spent selective catalytic reduction (SCR) catalysts used to control nitrous oxide emissions would make up the majority of the waste, and this waste stream could exhibit hazardous characteristics (NRC 2013c, Section 9.2.2.2). Wastes generated during operations would be properly managed and disposed of as hazardous or nonhazardous waste in permitted offsite facilities. Recycling and waste minimization programs such as those at WF3 would also be implemented as appropriate. Therefore, waste management impacts during operations under the NGCC plant alternative are anticipated to be SMALL.

7.1.3.2 Coal-Fired Generation

As discussed in Section 7.1.1.2, the coal-fired alternative would be an SCPC plant, configured to produce net electrical power virtually equivalent to the 1,188 net MWe generated by WF3. Based on a capacity factor of 85 percent (EIA 2013a), the alternative is scoped as a 1,398-MWe plant to provide replacement power for WF3. Entergy assumes that the SCPC plant alternative would utilize closed-cycle cooling with mechanical draft cooling towers, and be equipped with carbon capture and storage technology. Due to site requirements as discussed below, the plant could potentially be sited on the Entergy Louisiana, LLC property. Entergy Louisiana, LLC property along with much of Louisiana is underlain with saline or coal geological formations with the potential for storing carbon (NETL 2012). However, the siting of the SCPC plant would require proven carbon storage capacity. In addition, the Entergy Louisiana, LLC property includes wetlands whose avoidance is highly desirable to minimize impacts. Furthermore, the permitting of a new major air criteria pollutant would be dependent on NAAQS attainment status within the ACQR where it is to be located. Therefore, the SCPC plant is assessed for a hypothetical site rather than identifying the Entergy Louisiana, LLC property as the specific site as is done for the other alternatives. For this analysis, impacts are based on the following assumptions:

- The plant would be located in Louisiana within the SERC transmission region in close proximity to an existing power plant.
- The plant would use closed-cycle cooling with mechanical draft cooling towers.
- The existing transmission line infrastructure would be sufficient to support the plant.
- The usable land at the site would be sufficient to avoid impacts on wetlands.
- The usable, previously disturbed land would be sufficient for the plant and infrastructure.
- The site would be located adjacent to a rail line or waterway capable of supporting delivery of coal in sufficient quantities for the plant's operation.
- The site would be at or near a geological formation capable of storing carbon emissions.

7.1.3.2.1 Land Use and Visual Resources

Land Use

Approximately 115 acres of land would be required for the SCPC plant alternative (ENERCON 2015b), based on a land use factor of 9.39E-06 acres per MWh (adapted from NETL 2010b, Figure 3-13). As previously discussed, the hypothetical site would be served by a rail line, requiring only the development of a rail spur on site, or would be served by a waterway capable of barge traffic that would deliver the needed coal supplies.

If the SCPC plant alternative is sited at a smaller previous plant site, then additional non-industrialized areas of the site may be needed. For example, an NGCC plant is typically one-half to one-third the size of an SCPC plant. If an SCPC plant is built on an existing NGCC plant site, the footprint of the SCPC plant would likely exceed the existing footprint of the NGCC site. Impacts could range from minimal, if the newly disturbed land surrounding the NGCC site was previously used for industrial purposes, to noticeable, if land that exceeded the original footprint of the NGCC plant site was previously used for non-industrial land uses. Therefore, the land use impacts from construction under the SCPC plant alternative could range from SMALL to MODERATE depending on the amount of land adjacent to the site that is converted to an industrial land use.

In its 1996 GEIS, the NRC estimated that approximately 22,000 acres would be needed for coal mining and waste disposal to support a 1,000-MWe plant during its operational life (NRC 1996, Section 8.3.9). Therefore, for a 1,398-MWe SCPC plant alternative, approximately 30,700 acres could be needed to support the plant for its lifetime. However, more recent impacts analysis for coal mining, based on limited case studies, indicates much less land would be transformed to support mining. NETL (2010b) study of the life-cycle cost of coal mining found the required feedstock of coal would result in land use impacts of approximately 1,350 acres (ENERCON 2015b). Much of this land is assumed to already experience some level of disturbance, because the land use would likely occur in existing coal mining areas. The elimination of 1,188 acres of uranium mining to supply fuel for WF3, estimated at approximately 1 acre per MWe (NRC 1996, Section 8.3.12) would offset some of these offsite land requirements. However, because the amount of land required for coal mining and processing could range from 1,350 to 30,700 acres, land use impacts during operations under the SCPC plant alternative are anticipated to range from SMALL to MODERATE.

Visual Resources

During construction, all of the clearing and excavation could potentially be visible off site. The SCPC plant alternative could be approximately 100 feet tall, with two to four exhaust stacks several hundred feet tall, and mechanical draft cooling towers. The facility would most likely be visible off site during daylight hours, and some structures may require aircraft warning lights. The condensate plumes from the cooling towers could also add to the visual impact.

In general, given that the SCPC plant alternative would be located near an existing power plant site, the new SCPC plant alternative could blend in with the surroundings. The power block of

the SCPC plant alternative would look very similar to the existing power plant, and construction would appear similar to other ongoing onsite activities. However, if cooling towers did not previously exist at the site, the impact could be noticeable. Aesthetic impacts could range from SMALL to MODERATE under the SCPC plant alternative, depending on whether aesthetic changes are limited to the immediate vicinity of the existing power plant site, or whether the new cooling towers result in a noticeable change within the viewshed of the plant.

7.1.3.2.2 Air Quality

Construction of a coal-fired power plant would result in the release of various criteria pollutants and GHGs from the operation of internal combustion engines in construction vehicles, equipment, delivery vehicles, and vehicles used by the commuting construction workforce. VOC releases would also result from the onsite storage and dispensing of vehicle and equipment fuels. Onsite activities would also generate fugitive dust. These impacts would be intermittent and short-lived, however, and adherence to well-developed and well-understood construction BMPs (e.g., development and execution of an appropriate fugitive dust control plan) would mitigate such impacts. Given that construction-related impacts on air quality from a coal-fired alternative would be of relatively short duration, impacts on air quality under the SCPC plant alternative are anticipated to be SMALL.

Air quality impacts associated with the operation of coal-fired generation are considerably different from those of nuclear power. SCPC plants emit SO_x , NO_x , particulate matter, and CO , all of which are regulated pollutants. [Table 7.1-2](#) provides emission estimates for the SCPC plant alternative. Emission control technology and percent control assumptions were based on alternatives the EPA has identified as being available for minimizing emissions. A new coal-fired electricity-generating plant would qualify as a new major source of criteria pollutants and would be subject to PSD of air quality review under CAA requirements and Louisiana state regulations. A new coal-fired electricity-generating plant would also need to comply with the New Source Performance Standard for coal-fired plants set forth in 40 CFR Part 60, Subpart Da: particulate matter and opacity [40 CFR 60.42Da]; SO_2 [40 CFR 60.43Da]; and NO_x [40 CFR 60.44Da]. In addition, the new coal-fired electricity-generating plant would qualify as a major source because of its potential to emit greater than 100 tons/year of criteria pollutants and would be required to secure a Title V operating permit. ([NRC 2013c](#), Section 9.2.2.1)

Section 169A of the CAA [42 USC 7401] establishes a national goal of preventing future, and remedying existing, impairment of visibility in mandatory Class I federal areas when impairment results from manmade air pollution. As discussed in [Section 3.2.4](#), Breton Wilderness Area on Breton Island is the only Class I area located within Louisiana; no other Class I areas within the neighboring states exist near the Louisiana border ([EPA 2015a](#)).

CO_2 emissions are a major contributor to anthropogenic GHG emissions, which have been suggested to contribute to climate change. These emissions result from the efficiency of the technologies utilized to produce and deliver the energy and carbon content of the fuel being utilized. Coal-fired electricity generation has the highest emissions rate of CO_2 of the fossil-fuel sources, and significantly higher emissions compared to nuclear power electricity generation. As

mentioned above, the SCPC plant alternative provides for carbon sequestration as proposed by EPA regulations (79 FR 1430). The proposed regulations require partial carbon capture sequestration technology operating to a level of 1,100 lb CO₂/MWh.

A new SCPC plant would also have to comply with CAA [42 U.S.C. 7651] Title IV reduction requirements for SO₂ and NO_x, which are the main precursors of acid rain and the major causes of reduced visibility. Title IV establishes maximum SO₂ and NO_x emission rates from existing plants and a system of SO₂ emission allowances that can be used, sold, or saved for future use by new plants. (NRC 2014d, Section 8.2.1)

More recently, the EPA has promulgated additional rules and requirements that apply to certain fossil fuel-based power plants, such as SCPC plant generation. The Cross-State Air Pollution Rule, the PSD and Title V Greenhouse Gas Tailoring Rule, and the Mercury and Air Toxics Standards for Power Plants impose several additional standards to limit ozone, particulate, mercury, and GHG emissions from fossil fuel-based power plants. A new SCPC plant would be subject to these additional rules and regulations. (NRC 2014d, Section 8.2.1)

As noted above, a new SCPC plant would be subject to several EPA regulations designed to minimize air quality impacts from operations. Nevertheless, a new SCPC plant would be a major source of criteria pollutants and GHGs, and the overall operational air quality impacts under the SCPC plant alternative would be MODERATE.

7.1.3.2.3 Noise

Noise activities associated with construction are temporary and given the required acreage for the site, there is much potential for the distance to the nearest sensitive receptors to be great enough that construction noise is attenuated to levels close to levels associated with community or commercial activity. Construction activities would be conducted in compliance with any applicable local noise ordinances. Therefore, construction-related noise impacts under the SCPC plant alternative are anticipated to be effectively managed and kept SMALL.

During operations, the SCPC plant alternative would introduce mechanical sources of noise that could be audible off site. Sources contributing to the noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations and mechanical draft cooling towers. Intermittent sources include the equipment related to coal and ash handling which, although intermittent, occur daily both during daylight and night time hours; transportation related to coal and lime/limestone delivery; use of outside loudspeakers; and the commuting of plant employees. In the case of rail delivery of supplies, noise impacts would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains, if applicable, significantly increases noise levels near the rail corridor, the short duration of the noise reduces the impacts. Therefore, operations-related noise impacts under the SCPC alternative could range from SMALL to MODERATE depending on the site location and proximity to residences.

7.1.3.2.4 Geology and Soils

During construction, sources of aggregate material, such as crushed stone and sand and gravel, would be required to construct buildings, foundations, roads, and parking lots. It is presumed that these resources would likely be obtained from commercial suppliers using local or regional sources. Land clearing during construction and the installation of power plant structures and impervious surfaces would expose soils to erosion and alter surface drainage. However, any ground disturbance of one or more acres would require that a construction stormwater permit be obtained from the LDEQ. The construction stormwater permit specifies BMPs to reduce erosion caused by stormwater runoff, thereby minimizing the risk of pollution from soil erosion and sediment, and potentially from other pollutants that the stormwater may contact. Removed soils and any excavated materials would be stored on site for redistribution, such as for backfill at the end of construction. Construction activities would be temporary and localized. Therefore, construction-related impacts under the SCPC plant alternative on geology and soils would be minimized and SMALL.

Land disturbance during operations would also be conducted in accordance with applicable permits and site procedures and plans. The SCPC plant alternative would also have to comply with stormwater permitting requirements to develop and maintain a SWPPP. The SWPPP identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater, such as erosion, and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. Therefore, operations-related impacts on geology and soils under the SCPC plant alternative would also be SMALL.

7.1.3.2.5 Hydrology (Surface Water and Groundwater)

Surface Water

Entergy assumes that there would be no direct use of surface water during construction. In addition, any dewatering of excavations is unlikely to consume enough water to affect surface water bodies. For the SCPC plant alternative, it is assumed that an intake and discharge infrastructure would be required. Dredge-and-fill operations would be conducted under a permit from the USACE and State-equivalent permits requiring the implementation of BMPs to minimize impacts. Construction activities associated with this alternative will alter onsite surface water drainage features. Some temporary impacts on surface water quality may result from increased sediment loading and from any pollutants in stormwater runoff from disturbed areas, from excavation, and dredge-and-fill activities. Stormwater runoff from construction areas and spills and leaks from construction equipment could potentially affect downstream surface water quality. Nevertheless for this alternative, it is anticipated that appropriate soil erosion and sediment control measures would be observed. Application of BMPs in accordance with an LDEQ stormwater construction permit, including appropriate waste management, water discharge, SWPPP, and spill prevention practices, would prevent or minimize surface water quality impacts during construction. Therefore, construction-related impacts under the SCPC plant alternative on surface water use and quality are anticipated to be SMALL.

During operations, the SCPC plant alternative would use mechanical draft cooling towers with the source of makeup water most likely supplied from a river. Cooling water treatment additives would essentially be the same as those for WF3. While the discharge water quality would be chemically similar, the discharge volume from the closed-cycle SCPC plant alternative would be a small fraction of the cooling water discharge and related effluents discharged from WF3's once-through cooling system. However, like WF3, cooling water discharges would be regulated under an LPDES permit to protect water quality. Therefore, operations-related impacts on surface water use and quality under the SCPC plant alternative would be SMALL.

Groundwater

Entergy assumes that construction water would be obtained from a local water supply system. Construction water would be required for uses such as potable and sanitary use by the construction workforce and for concrete production, equipment washdown, dust suppression, and soil compaction.

Foundation excavations may intrude on groundwater zones and require dewatering during construction. Discharge of water removed by dewatering activities would require an LPDES permit and compliance with any conditions, minimizing environmental impacts on receiving waters and soils. The potential impacts on groundwater from dewatering activities could stem from reductions in quantity and quality. Groundwater could also be affected by runoff that could contain contaminants, but compliance with appropriate waste management practices, a required construction stormwater permit and pollution prevention requirements, and spill prevention practices, would prevent or minimize such adverse impacts. Therefore, construction-related impacts on groundwater use and quality under the SCPC plant alternative would be SMALL.

During the operations period, it is assumed that a local water supply system would continue to provide potable water. Continuing dewatering activities, if necessary, would be regulated under an LPDES permit. In addition, appropriate waste management, SWPPP, and spill prevention practices, would prevent or minimize groundwater quality impacts. Therefore, operations-related impacts on groundwater use and quality under the SCPC plant alternative would be SMALL.

7.1.3.2.6 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

As discussed in [Section 7.1.3.2.1](#), the SCPC plant alternative requires approximately 115 acres of land, and it is assumed that the hypothetical site would not impact wetlands. During construction, terrestrial ecology impacts would primarily occur from land disturbance and destruction of habitat. Plant communities in the proposed construction footprint would be cleared to accommodate the new plant site, and wildlife would be displaced. The level of direct impacts would vary substantially based on the amount and ecological importance of directly affected habitats. Erosion and sedimentation, fugitive dust, and construction debris impacts would likely be minor with the implementation of appropriate BMPs. Therefore, construction-related impacts on terrestrial resources under the SCPC plant alternative could range from SMALL to MODERATE.

During operations, onsite temporary storage of coal, coal combustion residue (CCR), spent catalysts, and scrubber sludge, as well as any offsite waste disposal by landfilling of CCR, would also affect the terrestrial ecology by requiring conversion of existing habitat. Deposition of acid rain resulting from NO_x or SO_x emissions, and deposition of other pollutants could also affect terrestrial ecology. In addition, operation of the mechanical draft cooling towers would cause some deposition of dissolved solids on surrounding vegetation and soil from cooling tower drift. Cooling tower operational noise could also impact terrestrial wildlife, and there is the potential for bird collisions. However, these impacts would be similar to existing nuclear plants with cooling towers, which the NRC determined in the GEIS to be SMALL (NRC 2013b, Table 2.1-1). However, because it is assumed that the SCPC plant alternative would be located on previously disturbed land as discussed in Section 7.1.3.2, these impacts are anticipated to be SMALL.

As discussed in Section 7.1.3.2.1, the amount of land required for coal mining could range from 1,350 to 30,700 acres to support a coal-fired plant during its operational life. Offsetting a small portion of this offsite land use would be the elimination of the need for uranium mining and processing to supply fuel for WF3. It was estimated that approximately 1 acre per MWe would be affected for mining and processing the uranium during the operating life of a nuclear power plant (NRC 1996, Section 8.3.12). Because of the potentially large area of undisturbed habitat that could be affected by mining activities, the operations-related impacts on terrestrial resources under the SCPC plant alternative could range from SMALL to MODERATE.

Aquatic

Impacts on aquatic ecosystems during construction would be minimal, due to the relatively small amount of water required and controls on the quality of surface water discharges imposed by a construction stormwater permit and USACE permit. The construction stormwater permit would contain control measures to minimize the flow of disturbed soils into aquatic features, while the USACE permit would require BMPs for in-water work to minimize sedimentation and erosion. Therefore, construction-related impacts on aquatic resources under the SCPC plant alternative are anticipated to be SMALL.

Impacts on aquatic ecosystems during operation could take the form of impingement and entrainment due to the closed-cycle cooling system's water withdrawals, and thermal and chemical discharges associated with blowdown. Impingement and entrainment effects would be dependent on the quality of the source water and organisms residing within the local habitat, but use of closed-cycle cooling would minimize impacts. However, all impacts associated with impingement, entrainment, and thermal and chemical discharges would be controlled by an LPDES permit. The air emissions from the SCPC plant alternative would emit pollutants that could settle onto the source waterbody and introduce a new source of pollutants. However, the source waterbody would most likely dissipate and dilute the concentration of pollutants, resulting in minimal exposure to aquatic biota. Therefore, operations-related impacts on aquatic resources under the SCPC alternative are anticipated to be SMALL.

Special Status Species

The types and magnitudes of adverse impacts on ESA-listed species and EFH would depend on the proposed site, plant design, operation, and listed species and habitats present when the alternative is implemented. Therefore, Entergy cannot forecast a particular level of impact on special status species for this alternative.

7.1.3.2.7 Historic and Cultural Resources

Land areas affected by the construction of the SCPC plant alternative would be surveyed to identify and record historic and cultural resources. Any resources found would be recorded and evaluated for eligibility for listing on the NRHP. Mitigation of adverse effects would be considered if eligible properties were encountered. Areas with the most significant cultural resources would be avoided. Visual impacts, such as historic property viewsheds near the proposed power plant site, would also be evaluated.

The potential impacts on historic and cultural resources would vary depending on the site selected for the proposed SCPC plant alternative. The cooling towers could impact the viewshed of historic properties. However, siting the SCPC plant alternative near an existing power plant site could reduce the potential impacts on historic and cultural resources, if effectively managed under current laws and regulations. Therefore, the construction- and operations-related impacts on historic and cultural resources under the SCPC plant alternative are projected to have no adverse effect.

7.1.3.2.8 Socioeconomics

Socioeconomic Issues Other than Transportation

Two types of jobs would be created by this alternative: (1) construction jobs, which are transient, short in duration, and less likely to have a long-term socioeconomic impact; and (2) power plant operations jobs, which have the greater potential for permanent, long-term socioeconomic impacts. Workforce requirements for the construction and operation of the SCPC plant alternative were evaluated to measure their possible effects on current socioeconomic conditions.

In the GEIS, the NRC estimated the peak workforce required to construct a 1,000-MWe coal-fired plant at 1,200 to 2,500 (NRC 1996, Table 8.1). Therefore for the hypothetical 1,398-MWe SCPC plant, the peak workforce could range from approximately 1,680 to 3,500. The socioeconomic impact would be dependent on the setting for the plant (rural or urban), and cannot be projected without the selection of a site. However, the relative economic effect of this many workers on the local economy and tax base would vary with the greatest impacts occurring in the communities where the majority of construction workers would reside and spend their income. As a result, local communities could experience a short-term economic "boom" from increased tax revenue and income generated by construction expenditures, and the increased demand for temporary (rental) housing and public services, as well as commercial services.

After construction, local communities could experience a return to pre-construction economic conditions. Based on this information and given the number of workers required for the SCPC plant alternative, socioeconomic impacts during construction in communities near the site could range from MODERATE to LARGE.

In the GEIS, the NRC estimated the operations workforce for a 1,000-MWe coal-fired plant at 250 (NRC 1996, Table 8.2). Therefore, the operations workforce for the SCPC plant alternative would be approximately 350. Local communities would experience the economic benefits from increased tax revenue and income generated by operations expenditures, and demand for housing and public and commercial services. The amount of property tax payments under the SCPC plant alternative may also increase if additional land is required to support this alternative. The socioeconomic operations impacts under the SCPC plant alternative on local communities could range from SMALL to MODERATE.

The coal-fired alternative would also result in the loss of jobs at WF3 and a corresponding reduction in purchasing activity and revenue contributions to the regional economy. However, the reduction in jobs at WF3 could occur gradually as Entergy transitions from reactor operations to decommissioning. As discussed in Section 3.8.5, for property tax purposes, Louisiana calculates a total entity or unit value for regulated utilities in the state, including Entergy Louisiana, LLC, and does not value WF3 on a standalone basis. Therefore, Entergy Louisiana, LLC does not receive separate tax invoices for power plants. Because it is uncertain what portion of the tax payments made to St. Charles Parish is attributable to WF3, socioeconomic impacts in communities local to WF3 could range from SMALL to MODERATE.

Transportation

As discussed above, the SCPC plant alternative would have a peak construction workforce of approximately 1,680 to 3,500 workers. Larger components for the SCPC plant would most likely arrive by barge or rail, which would avoid potential traffic congestion and stoppages for transport of large components. Traffic congestion associated with the workforce could potentially be minimized by staggering workforce shifts. However, due to the uncertainty of where the SCPC plant alternative would be located (rural or urban setting), construction-related transportation impacts under the SCPC plant alternative could range from SMALL to MODERATE.

Traffic-related transportation impacts would be greatly reduced after construction of the SCPC plant alternative. Transportation impacts would include daily commuting by the operating workforce, equipment and materials deliveries, and the removal of commercial waste material to offsite disposal or recycling facilities by truck. The operations workforce of approximately 360 would be divided over shifts, and likely would not be noticeable relative to total traffic volumes on local roadways. Because coal would be transported by rail or waterway, the transportation infrastructure would experience little to no increased traffic from plant operations. Overall, given the relatively small operations workforce, operations-related transportation impacts under the SCPC plant alternative would be SMALL.

7.1.3.2.9 Human Health

Impacts on workers are expected to be similar to those experienced during construction of any major industrial facility. Compliance with OSHA worker protection rules would control those impacts on workers at acceptable levels. Construction would increase traffic on local roads, which could affect the health of the general public. Human health impacts would be the same for all facilities whether located on greenfield sites, brownfield sites, or at an existing nuclear power plant. Personal protective equipment, training, and engineered barriers would protect the workforce. Therefore, the impacts on human health from the construction of the SCPC plant alternative would be SMALL.

Coal-fired power plants introduce worker risks from coal and limestone mining, coal and limestone transportation, industrial operations at the plant, and waste disposal operations. In addition, there are stack emissions and secondary effects of deposition of eating foods grown in areas subject to pollutants emitted from power plant stacks. However, many of the byproducts of coal combustion responsible for health effects are largely controlled, captured, or converted in modern power plants. (NRC 2013c, Section 9.2.2.1)

Regulations restricting emissions have reduced potential health effects. Permitting agencies also impose site-specific emissions limits, as needed, to protect human health. Even if the SCPC plant alternative were located in a nonattainment area, emission controls and trading or offset mechanisms could prevent further regional degradation; however, local effects could be visible. (NRC 2013c, Section 9.2.2.1) Therefore, operations-related impacts on human health under the SCPC plant alternative would be SMALL.

7.1.3.2.10 Environmental Justice

Potential impacts on minority and low-income populations from the construction and operation of the SCPC plant alternative near an existing power plant site would consist of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts from construction would be short-term and primarily limited to onsite activities. Minority and low-income populations residing along site access roads would be affected by increased commuter vehicle traffic during shift changes and truck traffic. However, these effects would be temporary during certain hours of the day and would not likely be high and adverse. Increased demand for rental housing during construction could affect low-income populations. However, given the proximity of some existing power plant sites to metropolitan areas, many construction workers could commute to the site, thereby reducing the potential demand for rental housing.

Emissions from the operation of the SCPC plant alternative could affect minority and low-income populations living in the vicinity of the new power plant. However, permitted air emissions are expected to remain within regulatory standards.

Based on this information and the analysis of human health and environmental impacts presented in Section 7.1.3.2 of this ER, the construction and operation of the SCPC plant alternative would not likely have disproportionately high and adverse human health and

environmental effects on minority and low-income populations. However, a definitive determination of the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations would depend on the SCPC plant alternative's location, plant design, and expected operations characteristics. Therefore, the effects on minority and low-income populations for this alternative cannot be definitively forecasted.

7.1.3.2.11 Waste Management

Sanitary wastes resulting from both the support of the construction crew and industrial wastes (some hazardous) would be generated during construction, such as clearing the construction site of vegetation, excavating and preparing the site surface before other crews begin actual construction of the plant, modifying existing infrastructure, and constructing any additional required infrastructure. Minor amounts of industrial wastes will result from the onsite maintenance of construction vehicles and equipment, the use of cleaning solvents, and the application of corrosion control coatings. Construction-related wastes are expected to be properly characterized and initially managed on site, and eventually removed to properly permitted offsite treatment disposal or recycling facilities. Construction-related waste impacts under the SCPC plant alternative are expected to be SMALL.

Coal combustion generated during the operations period includes several waste streams, including ash (a dry solid recovered from both pollution control devices [fly ash] and from the bottom of the boiler [bottom ash]) and sludge (a semi-solid byproduct of emission control system operation; in this case, primarily calcium sulfate from the operation of the wet calcium carbonate SO₂ scrubber) (NRC 2013c, Section 9.2.2.1). The estimated annual volumes of these wastes are presented in Table 7.1-3. Recycling and waste minimization programs applicable to these waste streams and other plant waste streams would be implemented as appropriate.

The impacts from waste generated during operation of the SCPC plant alternative would be dependent on the ability to recycle the solid wastes and dispose of the wastes that could not be recycled in dry ash piles in compliance with regulatory requirements. Based on the waste quantities requiring disposal as presented in Table 7.1-3, 40 years of operation could require from 167 to 387 acres to hold the ash and dry sludge wastes if the wastes were piled 30 feet high. Therefore, based on the large volume of waste, as well as the toxicity of the waste generated by coal combustion, and the uncertainty of recycling percentages of the waste, it is concluded that operations-related waste impacts could range from SMALL to MODERATE.

7.1.3.3 New Nuclear Generation

As discussed in Section 7.1.1.3, the new nuclear generation plant alternative involves the construction and operation of a new nuclear reactor on the Entergy Louisiana, LLC property. For purposes of this evaluation, it is assumed that the alternative would involve one unit with a generating capacity to replace WF3's base-load generation capacity of 1,188 MWe, which as a 90-percent capacity factor (EIA 2013a) would be a 1,320-MWe plant. The environmental impacts associated with constructing and operating the new nuclear plant alternative assumes (1) closed-cycle cooling with mechanical draft cooling towers would be utilized, (2) source of cooling water

would be the Mississippi River, (3) existing transmission infrastructure is adequate, and (4) existing intake and discharge structures can be utilized with some modifications.

7.1.3.3.1 Land Use and Visual Resources

Land Use

As shown in Figures 3.0-1 and 3.1-1, much of the Entergy Louisiana, LLC property north of LA-3127 is developed at a low intensity, (e.g., cleared, parking lot, agricultural). This analysis assumes that land on the Entergy Louisiana, LLC property could be developed for the new nuclear plant alternative, meeting levee setback restrictions and avoiding wetlands. The Entergy Louisiana, LLC property was previously the subject of a feasibility evaluation by the Idaho National Laboratory for locating a new nuclear plant. The evaluation determined four sites adjacent to WF3 to be feasible pending a more intensive investigation (INL 2011, Figure 5).

Based on previous acreage estimated for the Grand Gulf Nuclear Station Unit 3, Entergy is assuming that approximately 234 acres would be needed for this alternative (SERI 2008, Section 4.1.1). The new nuclear plant alternative would be located on property that is already zoned for heavy industry and constructed on previously disturbed land so that encroachment on wetlands can be avoided. In addition, the new nuclear plant alternative could make use of the existing infrastructure, which would reduce the amount of land needed to support the new unit. Therefore, construction-related impacts on land use under the new nuclear plant alternative would be SMALL.

During operations, there would be no net change in offsite land use impacts from the mining of uranium fuel, if supplies destined to be used during WF3 license renewal period were redirected for use at a new nuclear facility. Therefore, operations-related impacts on land use under the new nuclear plant alternative would be SMALL.

Visual Resources

During construction, all of the clearing and excavation would occur on site and may be visible off site. Because the existing power plant site already appears industrial and is situated in a heavily industrialized area, construction of the new nuclear power plant alternative would appear similar to other ongoing onsite activities. Therefore, construction-related impacts on visual resources under the new nuclear plant alternative would be SMALL.

The Entergy Louisiana, LLC property is already aesthetically altered by the presence of an existing nuclear power plant as well as Waterford 1, 2, and 4 fossil plants, and other industrial facilities nearby. Therefore, the new nuclear plant alternative would blend in with its surroundings. Aesthetic changes would therefore be limited to the immediate vicinity of the existing power plant site. Because cooling towers did not previously exist at the site, the impact could be noticeable. However, as previously discussed, the new nuclear plant alternative would be located in a heavily industrialized area where tall structures and visible plumes already exist. Therefore, operations-related impacts on visual resources under the new nuclear plant alternative are anticipated to be SMALL.

7.1.3.3.2 Air Quality

Construction of the new nuclear plant alternative would result in temporary impacts on local air quality. Ground-clearing, grading, and excavation activities would raise dust, as would the movement of materials and machinery. Fugitive dust may also arise from cleared areas during windy periods. In addition, emissions from these activities would contain various air pollutants, including CO, NO_x, SO_x, particulate matter, and VOCs, as well as various GHGs. Air emissions would be intermittent and vary based on the level and duration of a specific activity throughout the construction phase. Exhaust from the vehicles required to transport the construction workforce could also decrease air quality somewhat. Various mitigation techniques could be utilized to minimize air emissions and reduce fugitive dust. Because air emissions from construction activities would be limited, local, and temporary, construction-related impacts on air quality under the new nuclear plant alternative are anticipated to be SMALL.

Sources of air emissions during the operations phase include equipment such as emergency diesel generators and other minor emission sources that would be operated within federal and state air quality limits, some of which would only be operated intermittently. Similar to WF3, the new nuclear plant alternative would be considered a minor source of air emissions and subject to conditions established in an LDEQ-issued air permit that would be protective of Louisiana's ambient air quality standards to ensure that impacts are maintained at acceptable levels. As previously discussed in [Section 7.1.1.3](#), the new nuclear plant alternative would utilize a closed-cycle cooling system with mechanical draft cooling towers. Particulate emissions from the cooling towers would be subject to conditions established in the LDEQ-issued air permit. The NRC evaluated the impacts from cooling tower particulate emissions in the GEIS and considered these impacts to be SMALL ([NRC 2013b](#), Table 2.1-1). Therefore, the overall operations-related impacts on air quality under the new nuclear plant alternative would be SMALL.

In addition, as the NRC discussed in the GEIS, GHG emissions that would be associated with nuclear are lower than fossil fuel-based energy sources, and similar to the life-cycle GHG emissions from renewable energy sources ([NRC 2013b](#), Tables 4.12-4, 4.12-5, 4.12-6). Therefore, air quality impacts associated with the new nuclear plant alternative would avoid millions of tons of GHGs that otherwise would be produced by fossil fuel-fired generation, thereby resulting in a beneficial air quality impact.

7.1.3.3.3 Noise

Sources of noise during construction would include bulldozers, draglines, scrapers, haulers to excavate earth and grade, cranes, front loaders, graders, forklifts, man lifts, compressors, backhoes, dump trucks, a pier driller, and portable welding machines. These impacts would be intermittent and last only through the duration of plant construction. As previously discussed in [Section 7.1.3.1.3](#), the site is zoned heavy industrial and is located within an existing heavily industrialized area. The nearest residences are located approximately 0.9 miles to the northeast, east-northeast, northwest and west-northwest, and parks located approximately 1 mile northwest and 1 mile east-northeast, respectively, from the site. Therefore, construction-related noise impacts under the new nuclear plant alternative are anticipated to be SMALL.

Noise associated with the operation of a new nuclear plant would include sources such as cooling towers, switchyard, motors, generators, pumps, and trucks and cars typical of an operating industrial facility. The permanent workforce would also produce traffic noise during their commute to and from work. However, as previously discussed, the new nuclear plant alternative would be located in a heavily industrialized area, and noise levels are anticipated to be similar to those associated with WF3 operations. Therefore, operations-related noise impacts under the new nuclear plant alternative are expected to be SMALL.

7.1.3.3.4 Geology and Soils

During construction, sources of aggregate material, such as crushed stone and sand and gravel, would be required to construct buildings, foundations, roads, and parking lots. It is presumed that these resources would likely be obtained from commercial suppliers using local or regional sources. Land clearing during construction and the installation of power plant structures and impervious surfaces would expose soils to erosion and alter surface drainage. Any ground disturbance of one or more acres would require that a construction stormwater permit be obtained from the LDEQ. The construction stormwater permit specifies BMPs to reduce erosion caused by stormwater runoff, thereby minimizing the risk of pollution from soil erosion and sediment, and potentially from other pollutants that the stormwater may contact. Removed soils and any excavated materials would be stored onsite for redistribution such as for backfill at the end of construction. Construction activities would be temporary and localized. Therefore, construction-related impacts under the new nuclear plant alternative on geology and soils would be SMALL.

Land disturbance during operations would also be conducted in accordance with applicable permits and site procedures and plans. The new nuclear plant alternative would have to comply with stormwater permitting requirements to develop and maintain a SWPPP. The SWPPP identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater, such as erosion, and would contain BMPs that would be used to prevent or reduce the pollutants in stormwater discharges. Therefore, operations-related impacts on geology and soils under the new nuclear plant alternative would also be SMALL.

7.1.3.3.5 Hydrology (Surface Water and Groundwater)

Surface Water

Entergy assumes that there would be no direct use of surface water during construction, because water could be supplied by a local water utility. In addition, the dewatering of excavations is unlikely to consume enough water to affect surface water bodies at this location adjacent to the Mississippi River. For the new nuclear plant alternative, Entergy also assumes that WF3's existing intake and discharge infrastructure would be modified to maximize use of existing facilities. This would reduce construction-related impacts on surface water quality. Dredge-and-fill operations would be conducted under a permit from the USACE and State-equivalent permits requiring the implementation of BMPs to minimize impacts.

Construction activities associated with this alternative will alter onsite surface water drainage features. Some temporary impacts on surface water quality may result from increased sediment loading and from any pollutants in stormwater runoff from disturbed areas, excavation, and dredge-and-fill activities. Stormwater runoff from construction areas, and spills and leaks from construction equipment could potentially affect downstream surface water quality. Nevertheless, for this alternative, it is anticipated that appropriate soil erosion and sediment control measures would be observed. Application of BMPs in accordance with an LDEQ stormwater construction permit, including appropriate waste management, water discharge, SWPPP, and spill prevention practices, would prevent or minimize surface water quality impacts during construction. Therefore, construction-related impacts on surface water use and quality under the new nuclear plant alternative are anticipated to be SMALL.

During operations, the new nuclear plant would utilize mechanical draft cooling towers with the source of makeup water supplied by the Mississippi River. Water withdrawals would be a fraction of that required by WF3's once-through cooling system, and water consumption as a result of cooling tower evaporative losses would be insignificant compared to the volume of water flowing in the Mississippi River.

Cooling water treatment additives would essentially be the same as WF3. While the discharge water quality would be chemically similar, the water discharge volume from the new closed-cycle nuclear plant alternative would be a small fraction of that discharged from WF3's once-through cooling system. However, like WF3, water discharges would be regulated under an LPDES permit to protect water quality. Therefore, operations-related impacts on surface water use and quality under the new nuclear plant alternative would be SMALL.

Groundwater

Entergy assumes that construction water would be obtained from the St. Charles Parish water system whose source of water is the Mississippi River, and who currently supplies water to WF3. Construction water would be required for uses such as potable and sanitary use by the construction workforce and for concrete production, equipment washdown, dust suppression, and soil compaction.

Foundation excavations may intrude on groundwater zones and require dewatering during construction. Discharge of water removed by dewatering activities would require an LPDES permit and compliance with any conditions, minimizing environmental impacts on receiving waters and soils. The potential impacts on groundwater from dewatering activities could stem from reductions in quantity and quality. However, as discussed in [Section 3.5.2](#), shallow and deeper aquifers underlie the site, but groundwater usage is limited and is mainly for industrial purposes. Groundwater could also be affected by runoff that could contain contaminants, but compliance with appropriate waste management practices, a required construction stormwater permit and pollution prevention requirements, and spill prevention practices, would prevent or minimize such adverse impacts. Therefore, construction-related impacts on groundwater use and quality under the new nuclear plant alternative would be SMALL.

During the operations period, it is assumed that the St. Charles Parish water system would continue to supply potable water. Continuing dewatering activities, if necessary, would be regulated under an LPDES permit. In addition, appropriate waste management, SWPPP, and spill prevention practices, would prevent or minimize groundwater quality impacts. Therefore, operations-related impacts on groundwater use and quality under the new nuclear plant alternative would be SMALL.

7.1.3.3.6 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

Terrestrial ecology impacts from construction of the new nuclear plant alternative would primarily occur from land disturbance. As discussed in [Section 7.1.3.3.1](#), a new nuclear plant would require approximately 234 acres of land on the Entergy Louisiana, LLC property. The site has available acreage that is already disturbed and would not encroach on the wetlands of the site, which are primarily found south of LA-3127. Furthermore, the site is an industrial site with existing industry onsite (Waterford 1, 2, and 4), and industrial and transportation corridors are adjacent.

Plant communities in the proposed construction footprint would be cleared to accommodate the new plant site, and wildlife would relocate by their own means. Erosion and sedimentation, fugitive dust, and construction debris impacts would be minor with implementation of appropriate BMPs. Disturbed areas would be revegetated with native and non-invasive flora species, as appropriate. Because WF3 is located in a heavily industrialized area, wildlife species have most likely acclimated to noise activities associated with this area. Therefore, construction-related impacts on terrestrial resources under the new nuclear plant alternative are anticipated to be SMALL.

The impacts on terrestrial resources from operation of the new nuclear plant alternative would be similar to continued operation of WF3, with the exception of impacts due to the operation of onsite mechanical draft cooling towers. Operation of the cooling towers would cause some deposition of dissolved solids on surrounding vegetation and soil from cooling tower drift. Other impacts such as fogging and shadowing, etc. would also occur. Operational noise from the mechanical draft cooling towers could also impact terrestrial wildlife, and there is the potential for bird collisions. However, these impacts would be similar to those at existing nuclear plants with cooling towers, which the NRC determined in the GEIS to be SMALL ([NRC 2013b](#), Table 2.1-1). Therefore, it is concluded that overall operations-related impacts on terrestrial resources under the new nuclear plant alternative would be SMALL.

Aquatic

Impacts on aquatic ecosystems during construction would be minimal, due to the relatively small amount of water required and controls on the quality of surface water discharges imposed by a construction stormwater permit and USACE permit. The construction stormwater permit would contain control measures to minimize the flow of disturbed soils into aquatic features, while the USACE permit would require BMPs for in-water work to minimize sedimentation and erosion.

Therefore, construction-related impacts on aquatic resources under the new nuclear plant alternative are anticipated to be SMALL.

During operations, the new nuclear plant alternative would require less cooling water to be withdrawn from the Mississippi River than required for WF3. Because of the lower withdrawal rates, the number of fish and other aquatic resources affected by cooling-water intake and discharge operations, such as entrainment, impingement, and thermal stress, would be less for the new nuclear plant alternative than for those associated with license renewal. The cooling system for the new nuclear plant alternative would have chemical discharges similar to those from WF3 which would be regulated by an LPDES permit, but the air emissions from the new nuclear plant alternative would emit pollutants that could settle onto the river surface and introduce a new source of pollutants. However, the flow of the Mississippi River would likely dissipate and dilute the concentration of pollutants, resulting in minimal exposure to aquatic biota. Therefore, operations-related impacts on aquatic resources under the new nuclear plant alternative are anticipated to be SMALL.

Special Status Species

The NRC would remain the licensing agency under this alternative, and thus, the ESA would require the NRC to initiate consultation with the USFWS and NMFS, as applicable, prior to construction to ensure that the construction and operation of the new nuclear plant would not adversely affect any federally listed species or adversely modify or destroy designated critical habitat.

As discussed in [Section 3.6.11](#), no suitable habitat was identified on the Entergy Louisiana, LLC property for any of the federally listed species in St. Charles Parish during an October 2014 threatened and endangered species habitat survey, and no federally listed species were identified as being present on site. Although suitable habitat for three state-listed species was identified in undisturbed portions of the Entergy Louisiana, LLC property, the survey did not identify any of the state-listed species as being present on the Entergy Louisiana, LLC property. Because the site has available acreage that is already disturbed, as discussed in [Section 7.1.3.1.6](#), construction- and operations-related impacts on special status species under the new nuclear plant alternative are anticipated to have no effect. Based on consultation with the NMFS, no EFH has been designated in the Mississippi River in the vicinity of WF3 ([Attachment B](#)).

7.1.3.3.7 Historic and Cultural Resources

As discussed in [Section 7.1.3.3.1](#), a new nuclear plant would require approximately 234 acres of land on site, and already disturbed acreage is available. The cultural resources on site and in the vicinity are detailed in [Section 3.7](#). As discussed in [Section 3.7](#), the only area located on the Entergy Louisiana, LLC property eligible for listing on the NRHP is the Waterford Plantation. The Killona Plantation and possibly a portion of the Providence Plantation are also located on the Entergy Louisiana, LLC property, although neither of these sites has been surveyed to determine their NRHP eligibility. Therefore, any construction activities would either need to avoid these areas, or in the case of the Killona and Providence plantations, surveys would need to be conducted to determine their NRHP eligibility. However, as portions of the Entergy Louisiana,

LLC property have been previously identified as not containing significant historic and cultural resources, use of these areas for a new nuclear plant alternative would have no effect on historic and cultural resources.

Given that the preference is to use previously surveyed and/or disturbed areas, avoidance of significant historic and cultural resources should be possible and effectively managed under current laws and regulations. Therefore, the construction and operation of the new nuclear plant alternative is projected to have no adverse effect on historic and cultural resources.

7.1.3.3.8 Socioeconomics

Socioeconomic Issues Other than Transportation

Two types of jobs would be created by this alternative: (1) construction jobs, which are transient, short in duration, and less likely to have a long-term socioeconomic impact; and (2) power plant operations jobs, which have the greater potential for permanent, long-term socioeconomic impacts. Workforce requirements for the construction and operation of the new nuclear plant alternative were evaluated to measure their possible effects on current socioeconomic conditions.

New nuclear construction is currently underway at three existing plants in the United States: two involve the construction of two units, and one is constructing a single unit. The two-unit construction projects have projected peak workforces of 3,500 and 5,000, respectively ([POWER 2013](#) and [Augusta Chronicle 2014](#)). Using actual workforce numbers for constructing the single unit, Watts Bar 2 ([TVA 2012](#)), a workforce size of approximately 2,100 was assumed for construction of the new nuclear plant alternative. Given the proximity of New Orleans and Baton Rouge, the majority of a construction workforce would be expected to reside within the region (50-mile radius of WF3). It is expected that the remainder of the construction-related workforce would in-migrate from outside the region in the same residential distribution as the current WF3 workforce. It is not expected that many in-migrating construction workers would permanently relocate to the region, so any socioeconomic effect induced by the in-migrating workers would be temporary. Therefore, construction-related socioeconomic impacts under the new nuclear plant alternative are anticipated to be SMALL.

Entergy assumes that the number of operations workers at the new nuclear plant alternative would be similar to the number of operations workers at WF3, but there could be a temporary increase in employment at the site from decommissioning activities at WF3. Entergy also assumes that property taxes for the new nuclear alternative would be comparable to those of WF3. Therefore, operations-related socioeconomic impacts under the new nuclear plant alternative could range from SMALL to MODERATE.

Transportation

A network of interstate highways surrounds the Entergy Louisiana, LLC property, with LA-18 providing access to WF3. Larger components for the new nuclear plant would likely arrive by barge or rail, which would avoid potential traffic congestion and stoppages for transport of large

components. The traffic capacity of these roads and the ability to stagger workforce shifts, if needed, would minimize traffic congestion; however, construction-related transportation impacts under the new nuclear plant alternative could still be MODERATE.

Traffic-related transportation impacts would be greatly reduced after construction of the new nuclear plant alternative. Transportation impacts would include daily commuting by the operating workforce, equipment and materials deliveries, and the removal of commercial waste material to offsite disposal or recycling facilities by truck. Therefore, operations-related transportation impacts under the new nuclear plant alternative are anticipated to be SMALL.

7.1.3.3.9 Human Health

Impacts on human health from construction of the new nuclear plant alternative would be similar to effects associated with the construction of any major industrial facility. Compliance with OSHA worker protection rules would control those impacts on workers at acceptable levels. The radiological human health impact on construction workers due to the proximity of WF3 still operating at that time would also be SMALL due to compliance with NRC regulations and adherence to ALARA principles. NRC reviewed the human health and environmental impacts from radiological emissions and waste in its license renewal GEIS and found the impacts to be SMALL (NRC 2013b, Table 2.1-1). Impacts from construction on the general public would be minimal, because crews would limit access to active construction area to authorized individuals. Based on the above, the construction-related impacts on human health under the new nuclear plant alternative would be SMALL.

The human health effects from the operation of the new nuclear plant alternative would be similar to those of the existing WF3 plant. As presented in Section 4.9, impacts on human health from the operation of WF3 would be SMALL. In addition, the NRC determined in the GEIS that impacts from radiological emissions and waste would be SMALL (NRC 2013b, Table 2.1-1). Therefore, overall operations-related impacts on human health under the new nuclear plant alternative would be SMALL.

7.1.3.3.10 Environmental Justice

Potential impacts on minority and low-income populations from the construction of the new nuclear plant alternative on the Entergy Louisiana, LLC property would mostly consist of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts). Noise and dust impacts during construction would be short-term, though longer than for the NGCC or coal-fired plant alternatives, and primarily limited to onsite. Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic. However, because of the temporary nature of construction, these effects are not likely to be high and adverse and would be contained to a limited time period during certain hours of the day. Increased demand for rental housing during construction could cause rental costs to rise disproportionately, affecting low-income populations living near WF3 who rely on inexpensive housing. However, given the proximity of New Orleans and Baton Rouge metropolitan areas and their volume of temporary and permanent housing across the

social economic spectrum, any upward pressure on housing expenses would not be expected to be disproportionately felt within minority or low-income populations.

Based on this information and the analysis of human health and environmental impacts presented in [Section 7.1.3.3](#) of this ER, the construction and operation of a new nuclear plant would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of WF3.

7.1.3.3.11 Waste Management

Sanitary wastes resulting from both the support of the construction crew and industrial wastes (some hazardous) would be generated during construction. Construction-related wastes are expected to be properly characterized and initially managed on site and eventually removed to properly permitted offsite treatment or disposal facilities. Waste impacts from construction under the new nuclear plant alternative are expected to be SMALL.

During operation, the new nuclear plant alternative would generate nonhazardous, hazardous, spent nuclear fuel, and radioactive waste. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. Entergy has internal recycling and waste minimization programs that would reduce waste volumes. Spent nuclear fuel would be managed on site per NRC regulations and the nuclear plant's NRC OL. Radioactive waste would be managed on site in accordance with NRC and state regulations and disposed of in permitted facilities. The NRC reviewed the impacts from nonradioactive and radioactive waste in the GEIS and determined the impacts to be SMALL ([NRC 2013b](#), Table 2.1-1). Therefore, waste management impacts during operations under the new nuclear plant alternative would be SMALL.

7.1.3.4 Combination of Alternatives

As discussed in [Section 7.1.1.4](#) and shown below, the combination of alternatives involves the construction and operation of NGCC and biomass plants at the Entergy Louisiana, LLC site and implementation of DSM programs for an annual reduction in demand. This combination of alternatives (NGCC plant, biomass plants, and DSM) was also selected by the NRC as a reasonable alternative to replace the base-load power generated by the Grand Gulf Nuclear Station, Unit 1 plant, which is also located in the southeastern United States ([NRC 2014b](#), Section 8.4):

- A 668-MWe NGCC plant operating at an 87-percent capacity factor ([EIA 2013a](#)) for a total of 581 MWe.
- Four 50-MWe biomass plants operating at an 83-percent capacity factor ([EIA 2013a](#)) for a total of 166 MWe.
- DSM programs providing 441 MWe.

The biomass plants would be capable of using a variety of biomass fuels such as wood waste, crop residue, energy crops, and MSW to take advantage of the feedstock options available in the area, as well as for greater assurance of reliable feedstock.

Based on the projected supply for 2025 stemming from DSM programs as discussed in [Section 7.1.2.1.3](#), it is assumed that the potential for an annual savings of 441 MW from implementation of a variety of energy efficiency and demand reduction programs can be achieved. The environmental impacts associated with the combination alternatives based on the assumptions described in [Section 7.1.1.4](#) are described below.

7.1.3.4.1 Land Use and Visual Resources

Land Use

As previously discussed in [Section 7.1.3.1.1](#), there is ample availability of disturbed land on the Entergy Louisiana, LLC property to avoid encroachment into wetlands as a result of construction activities. For the NGCC plant combination alternative, an estimated 29 acres would be needed, approximately 50 percent of that required for the discrete NGCC plant alternative discussed in [Section 7.1.3.1.1](#). Also as discussed in [Section 7.1.3.1.1](#), the natural gas pipeline closest to WF3 capable of supplying adequate gas supply to operate the NGCC plant alternative is the TETCO pipeline, approximately 6–7 miles south of WF3 on the same side of the Mississippi River. In addition, offsite land is typically required for natural gas wells and collection stations during operations. However, as previously discussed in [Section 7.1.3.1.1](#), there is an abundance of gas supply being transported from the northeast United States through the TETCO pipeline to the Gulf area. Therefore, Entergy assumes that no additional offsite land would be required.

The biomass plants component of the combination alternative would require an estimated 60 acres based on the NRC's previous use of 15 acres per unit ([NRC 2014b](#), Section 8.4.7). The biomass plants' fuel mix is assumed to include energy crops, but based on the NREL profile for energy crop supplies in the area, as discussed in [Section 7.1.2.2.7](#), additional conversion of land to cultivate the energy crops is not anticipated. Forest residue and wood waste are byproducts of the timber industry, and thus activities associated with the production of this feedstock will occur regardless of whether a biomass-fired power plant is available to use the feedstock. Accordingly, the land use impacts associated with the production of this feedstock will be the same regardless whether the feedstock is used for electricity generation or not. However, additional land would be required for storing, loading, and transporting forest residue and wood waste power plant feedstock. Ultimately, land use impacts would depend on the characteristics of the affected forested lands and the effects of storing, loading, and transporting the biomass feedstock ([NRC 2014b](#), Section 8.4.7).

DSM would have little to no direct land use impacts. However, quickly replacing old inefficient appliances and other equipment could generate waste material and potentially increase the size of landfills. However, given time for program development and implementation, the cost of replacements, and the average life of an appliance, the replacement process likely would be gradual. For example, older appliances would be replaced by more efficient appliances as they fail (especially in the case of frequently replaced items, such as light bulbs). In addition, many

appliances and industrial equipment have substantial recycling value and would not be disposed of in landfills. (NRC 2014b, Section 8.4.7)

Overall land use impacts from the construction and operation of the combination alternative could range from SMALL to MODERATE.

Visual Resources

Aesthetic impacts from the NGCC plant component of the combination alternative would be essentially the same as those described for the discrete NGCC alternative in Section 7.1.3.1.1. Plant infrastructure generally would be smaller and less noticeable than the WF3 plant structures. As previously discussed in Section 7.1.3.1.1, the Entergy Louisiana, LLC property is already aesthetically altered by the presence of existing power plants and other industrial facilities within the area. The biomass plants would look similar to other fossil-fuel power plants with a boiler stack and cooling towers. In addition, it would have feedstock storage, handling, and processing facilities. Combustion exhaust and cooling steam plumes may be visible in close proximity to the plant depending on atmospheric conditions. However as previously discussed, the Entergy Louisiana, LLC property is already aesthetically altered by the presence of existing power plants and other industrial facilities within the area. No aesthetic impacts would be expected for the DSM component of this alternative.

Overall aesthetic impacts as a result of the construction and operation of the combination alternative would be SMALL.

7.1.3.4.2 Air Quality

Construction activities associated with the NGCC plant and biomass plants combination alternatives would generate fugitive dust. However, mitigation measures, including wetting of unpaved roads and construction areas, and seeding or mulching bare areas would minimize fugitive dust. Construction worker vehicles and motorized construction equipment would create exhaust emissions. However, these emissions would end upon completion of construction.

During operations, the air quality emissions from the NGCC plant combination alternative would be slightly more than 50 percent of the quantities for the discrete NGCC plant alternative as shown in Table 7.1-4. The biomass plants component of the combination alternative would also emit air pollutants that would be dependent on the feedstock, but nevertheless in compliance with the MACT standards as discussed in Section 7.1.2.2.6. The biomass plants' annual SO₂ and NO_x emissions based on a feedstock of MSW would be approximately 1,050 tons and 5,870 tons, respectively (ENERCON 2015b). The biomass plants' annual CO₂ generation, based on MSW, would be approximately 890,000 tons (ENERCON 2015b). As discussed in Section 7.1.3.1.2 and Section 7.1.2.2.6, an NGCC plant and biomass plants would be subject to several EPA regulations designed to minimize air quality impacts from operations. Nevertheless, a new NGCC plant and the four biomass plants would be a major source of criteria pollutants and GHGs. Air quality impacts from the DSM component of the combination alternative would be negligible.

Overall air quality impacts from the construction and operation of the combination alternative could range from SMALL to MODERATE.

7.1.3.4.3 Noise

The construction of the NGCC and biomass plants would have noise impacts similar to that of the discrete NGCC plant alternative discussed in [Section 7.1.3.1.3](#).

Most noise generated during NGCC plant operations would be limited to industrial processes and communications. Pipelines delivering natural gas fuel could be audible off site near gas compressor stations. However, pipeline companies and the NGCC plant combination alternative on the Entergy Louisiana, LLC property would need to adhere to local ordinances regarding maximum noise levels during operations. The biomass plants would have feedstock storage, handling, and processing facilities. Noise may be detectable off site during the delivery and onsite handling operations of the feedstock, but given the industrial setting and setback requirements of the local ordinances, noise impacts would be minimized on adjacent properties. No noise impacts would be expected for the DSM component of this alternative.

Overall noise impacts as a result of the construction and operation of the combination alternative would be SMALL.

7.1.3.4.4 Geology and Soils

The impact on geology and soils due to constructing and operating the NGCC and associated gas pipeline, and biomass plants on the Entergy Louisiana, LLC property would be similar to that of the discrete NGCC plant alternative discussed in [Section 7.1.3.1.4](#). Any ground disturbance of one or more acres would require a construction stormwater permit from the LDEQ, which specifies BMPs to reduce erosion caused by stormwater runoff, thereby minimizing the risk of pollution from soil erosion and sediment, and potentially from other pollutants that the stormwater may contact. Construction activities would be temporary and localized. During operations, the NGCC plant and biomass plant combination alternatives would have to comply with stormwater permitting requirements to develop and maintain a SWPPP that identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater, such as erosion, and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. No geology and soil impacts would be expected for the DSM component of this alternative.

Overall, construction and operational impacts on geology and soils of the combination alternative are anticipated to be SMALL.

7.1.3.4.5 Hydrology (Surface Water and Groundwater)

Surface Water

The impact on surface water use and quality due to constructing and operating the NGCC and biomass plants on the Entergy Louisiana, LLC property would be similar to that of the discrete

NGCC plant alternative as discussed in [Section 7.1.3.1.5](#). However, no surface water use and quality impacts would be expected for the DSM component of this alternative.

WF3's existing intake and discharge infrastructure would be modified to maximize use of existing facilities, reducing construction-related impacts on surface water quality. Dredge-and-fill operations would be conducted under a permit from the USACE and State-equivalent permits requiring the implementation of BMPs. Stormwater runoff from construction areas and spills and leaks from construction equipment could potentially affect downstream surface water quality. However, application of BMPs in accordance with an LDEQ stormwater construction permit, including appropriate waste management, water discharge, SWPPP, and spill prevention practices, would prevent or minimize surface water quality impacts during construction. Therefore, construction-related impacts on surface water use and quality under the combination alternative would be SMALL.

Depending on the path of any required new gas pipelines to service the NGCC plant alternative, some stream crossings could be necessary. However, because of the short-term nature of any required dredge-and-fill and stream-crossing activities, the hydrologic alterations and sedimentation would be localized and water-quality impacts would be temporary. In addition, modern pipeline construction techniques, such as horizontal directional drilling, would further minimize the potential for water-quality impacts on the affected streams. Such activities, including any dredge-and-fill operations, would be conducted under a permit from the USACE or State-equivalent permits for dredge-and-fill and stream encroachment, requiring the implementation of BMPs to minimize impacts. Therefore, construction-related impacts on surface water use and quality are anticipated to be SMALL.

During operations, the NGCC plant and biomass plants components of the combination alternative would use mechanical draft cooling towers with the source of makeup water supplied by the Mississippi River. Water withdrawals would be a fraction of that required by WF3's once-through cooling system, and water consumption as a result of cooling tower evaporative losses would be insignificant compared to the volume of water flowing in the Mississippi River. Cooling water treatment additives would essentially be the same as WF3. While the discharge water quality would be chemically similar, the effluents discharge volume from the closed-cycle NGCC plant and biomass plants would be a small fraction of that discharged from WF3's once-through cooling system. However, like WF3, cooling water discharges would be regulated under an LPDES permit to protect water quality. Therefore, operations-related impacts on surface water use and quality under the NGCC plant and biomass plants components of the combination alternative would be SMALL.

Groundwater

The impact on groundwater use and quality due to constructing and operating the NGCC plant and biomass plant components of the combination alternative on the Entergy Louisiana, LLC property would be similar to that of the discrete NGCC plant alternative as discussed in [Section 7.1.3.1.5](#). No groundwater use and quality impacts would be expected for the DSM component of this alternative.

Entergy assumes that construction water for uses such as potable and sanitary use by the construction workforce and for concrete production, equipment washdown, dust suppression, and soil compaction, would be obtained from the St. Charles Parish water system whose source of water is the Mississippi River. Any discharge involving dewatering activities would require an LPDES permit. Dewatering activities, if needed, are not anticipated to affect groundwater quantity and quality, because groundwater usage within the vicinity of WF3 is limited and mainly for industrial purposes. Appropriate waste management practices, a required construction stormwater permit and pollution prevention requirements, and spill prevention practices, would prevent or minimize impacts on groundwater quality as a result of stormwater runoff.

During the operations period, Entergy assumes that the St. Charles Parish water system would continue to supply potable water. Continuing dewatering activities, if necessary, would be regulated under an LPDES permit. In addition, appropriate waste management, SWPPP, and spill prevention practices, would prevent or minimize groundwater quality impacts.

Therefore, the construction- and operations-related impacts on groundwater use and quality of the combination alternative would be SMALL.

7.1.3.4.6 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

The impact on terrestrial resources due to constructing and operating the NGCC plant (and associated gas pipeline) and biomass plants on the Entergy Louisiana, LLC property would be similar to that of the discrete NGCC discussed in [Section 7.1.3.1.6](#). The DSM component of the combination alternative would have no impact on terrestrial resources.

The NGCC and biomass plants components of the combination alternative would be located on the Entergy Louisiana, LLC property, and predominantly previously developed or previously disturbed land would be affected. The new NGCC plant alternative gas pipeline could potentially be collocated within an existing ROW. Plant communities in the proposed construction footprint would be cleared, and wildlife would relocate by their own means. Erosion and sedimentation, fugitive dust, and construction debris impacts would be minor with implementation of appropriate BMPs. Disturbed areas would be revegetated with native and non-invasive flora species, as appropriate. As previously discussed in [Section 7.1.3.1.6](#), the site is an industrial site with existing power plants on site (Waterford 1, 2, and 4), and industrial and transportation corridors are adjacent. Also as discussed in [Section 7.1.3.1.1](#), minimal land would be required for new gas pipelines, and existing gas supply from the TETCO pipeline is assumed to be adequate for supporting operations of the NGCC plant component of the combination alternative.

During operations, it is not anticipated that wildlife species will be displaced, because the site is located in a heavily industrialized setting, and they have most likely acclimated to noise associated with activities in this area. Operation of the mechanical draft cooling towers could cause some deposition of dissolved solids on surrounding vegetation and soil from cooling tower drift. Operational noise from the cooling towers could also impact terrestrial wildlife, and there is

the potential for bird collisions with the cooling towers. However, these impacts would be similar to existing nuclear plants with cooling towers.

Overall, construction and operations impacts on terrestrial resources under the combination alternative are anticipated to be SMALL.

Aquatic

The impact on aquatic resources due to constructing and operating the NGCC and biomass plants on the Entergy Louisiana, LLC property would be similar to that of the discrete NGCC plant alternative, as discussed in [Section 7.1.3.1.6](#). The DSM component of this alternative would have no impact on aquatic resources.

Impacts on aquatic resources during construction would be minimal, due to the relatively small amount of water required and controls on the quality of surface water discharges imposed by a stormwater permit and USACE permit. Impingement and entrainment impacts from water withdrawals, and thermal and chemical impacts from blowdown discharges during operation would be less than projected impacts from continued operation of WF3 due to smaller heat rejection demand and less water withdrawals. All such impacts would be controlled by an LPDES permit issued by the LDEQ. The air emissions from the NGCC plant and biomass plant components of the combination alternative would emit particulates that would settle onto the river surface and introduce a new source of pollutants that would not exist if WF3 continued operating. However, the flow of the Mississippi River would dissipate pollutants, which would minimize the exposure of fish and other aquatic organisms to pollutants. Therefore, impacts on aquatic resources from the construction and operation under the combination alternative would be SMALL.

Special Status Species

As discussed in [Section 3.6.11](#), no suitable habitat was identified on the Entergy Louisiana, LLC property for any of the federally listed species in St. Charles Parish during an October 2014 threatened and endangered species habitat survey, and no federally listed species were identified as being present on site. Although suitable habitat for three state-listed species was identified in undisturbed portions of the Entergy Louisiana, LLC property, the survey did not identify any state-listed species as being present on the Entergy Louisiana, LLC property. Construction activities associated with the new gas pipeline would be subject to LDEQ construction stormwater permitting requirements, which would consider protection of special status species and associated designated habitats. Because the site has available acreage that is already disturbed, as discussed in [Section 7.1.3.1.6](#), construction- and operations-related impacts on special status species under the combination alternative are anticipated to have no effect. Based on consultation with the NMFS, no EFH has been designated in the Mississippi River in the vicinity of WF3 ([Attachment B](#)).

7.1.3.4.7 Historic and Cultural Resources

The impact on historic and cultural resources due to constructing and operating the NGCC and biomass plants components on the Entergy Louisiana, LLC property would be similar to that of the discrete NGCC plant alternative as discussed in [Section 7.1.3.1.7](#). No direct impacts on historic and cultural resources are expected from DSM.

The historic and cultural resources on site and in the vicinity are detailed in [Section 3.7](#). As discussed in [Section 3.7](#), the only area located on the WF3 property eligible for listing on the NRHP is the Waterford Plantation. The Killona Plantation and possibly a portion of the Providence Plantation are also located on the Entergy Louisiana, LLC property, although neither of these sites has been surveyed to determine their NRHP eligibility. Therefore, any construction activities would either need to avoid these areas, or in the case of the Killona and Providence plantations, surveys would need to be conducted to determine their NRHP eligibility. However, because portions of the Entergy Louisiana, LLC property have been previously identified as not containing significant historic and cultural resources, use of these areas for the NGCC plant and biomass plants components of the combination alternative would have no effect on historic and cultural resources.

As previously discussed in [Section 7.1.3.1.1](#), a new gas pipeline would have to be installed to connect the hypothetical NGCC plant alternative to the gas infrastructure. However, this new pipeline could be collocated within an existing ROW, or if not located within an existing ROW, the area could be surveyed to identify and record historic and cultural resources. No offsite land would be needed for gas wells and collection wells, because the existing gas supply from the TETCO pipeline is assumed to be adequate for supporting operations of the NGCC plant component of the combination alternative.

Given that the preference is to use previously surveyed and/or disturbed areas, avoidance of significant historic and cultural resources should be possible and effectively managed under current laws and regulations. Therefore, the construction- and operations-related impacts under the combination alternative are projected to have no adverse effect on historic and cultural resources.

7.1.3.4.8 Socioeconomics

Socioeconomic Issues Other than Transportation

Two types of jobs would be created by this alternative: (1) construction jobs, which are transient, short in duration, and less likely to have a long-term socioeconomic impact; and (2) power plant operations jobs, which have the greater potential for permanent, long-term socioeconomic impacts.

Scaling from the NRC's 1996 GEIS ([NRC 1996](#), Table 8.1) estimate of 1,200 workers needed to construct a 1,000-MWe natural gas plant, the NGCC plant combination component would have a peak construction workforce of approximately 800. Fifty construction workers are required for each of the four biomass plants, totaling 200 construction workers if all four units are constructed

at the same time (NRC 2014b, Section 8.4.8). Given the proximity of New Orleans and Baton Rouge, the majority of a construction workforce would be expected to reside within the region (50-mile radius of WF3). It is expected that the remainder of the construction-related workforce would in-migrate from outside the region in the same residential distribution as the current WF3 workforce. It is not expected that many in-migrating construction workers would permanently relocate to the region, so any socioeconomic effect induced by the in-migrating workers would be temporary.

Scaling from the NRC's 1996 GEIS (NRC 1996, Table 8.2) estimate of 150 workers needed to operate a 1,000-MWe natural gas plant, the NGCC plant combination component would have an operations workforce of 100. Each biomass unit is assumed to require 22 operations workers for a total of 88 operations workers for this component of the combination alternative (NRC 2014b, Section 8.4.8). Therefore, this combination alternative would result in the loss of approximately 450 relatively high-paying jobs at WF3. This reduction in employment at WF3 from operations to decommissioning and shutdown could affect property tax revenue and income in local communities and businesses. In addition, the permanent housing market could also experience increased vacancies and decreased prices if WF3 operations workers and their families move out of the region. In addition, the property taxes levied on the operating NGCC and biomass plants components of the combination alternative would likely be less than that of an operating nuclear plant. However, this may be offset some by the property taxes paid to local jurisdictions from the NGCC plant and biomass plants components of the combination alternative.

The DSM component could generate additional employment, depending on the nature of the conservation programs and the need for direct measure installations in homes and office buildings. Jobs would likely be few and scattered throughout the region, and would not have a noticeable effect on the local economy.

Overall, the socioeconomic impacts from the construction and operation of the combination alternative could range from SMALL to MODERATE.

Transportation

Transportation impacts during the construction and operation of the NGCC and biomass plants components of the combination alternative would be less than the impacts for any of the previous alternatives discussed, because the construction workforce for each component and the volume of materials and equipment to be transported to each respective construction site would be smaller than each of the other alternatives.

During construction, commuting workers and trucks transporting construction materials and equipment to the work site would increase the amount of traffic on local roads. The increase in vehicular traffic would peak during shift changes, resulting in temporary levels of service impacts and delays at intersections. Transporting heavy and oversized components on local roads could have a noticeable impact over a large area. Some components and materials also could be delivered by rail or barge. During operations, transportation impacts from the NGCC plant and biomass plants components of the combination alternative would be less noticeable than during

construction. No incremental operations impacts would be expected for the DSM component of this alternative.

Overall, transportation impacts from the construction and operation of the combination alternative could range from SMALL to MODERATE.

7.1.3.4.9 Human Health

Impacts on human health from construction of the NGCC plant (including the construction of a new gas pipeline) and biomass plants components of the combination alternative would be similar to impacts associated with the construction of any major industrial facility. Compliance with OSHA worker protection rules would control those impacts on workers at acceptable levels. Impacts from construction on the general public would be minimal, because crews would limit access to active construction areas to authorized individuals. The radiological human health impact on construction workers, operations workers, and the surrounding public would also be SMALL due to compliance with NRC regulations and adherence to ALARA principles. The NRC reviewed the human health and environmental impacts from radiological emissions and waste in its license renewal GEIS and found the impacts to be SMALL (NRC 2013b, Table 2.1-1).

Construction and operations impacts for the DSM component of the combination alternative would be minimal and localized to activities such as weatherization efficiency of an end-user's home or facility. The GEIS notes that the environmental impacts are likely to be centered on indoor air quality due to increased weatherization of the home in the form of extra insulation and reduced air turnover rates from the reduction in air leaks. However, the actual impact is highly site specific and not yet well established. (NRC 2014b, Section 8.4.6).

Human health effects of gas-fired generation are generally low, although in Table 8.2 of the GEIS (NRC 1996), the NRC identified cancer and emphysema as potential health risks from gas-fired plants. NO_x emissions contribute to ozone formation, which in turn contributes to human health risks. Emission controls on the NGCC plant component of the combination alternative can be expected to maintain NO_x emissions well below air quality standards established to protect human health, and emissions trading or offset requirements mean that overall NO_x releases in the region would not increase. Health risks for workers may also result from handling spent catalysts used for NO_x control that may contain heavy metals.

Using biomass for energy consists of the direct burning of MSW, crop residue, and/or forest residue/wood waste. Given this source of fuel for power generation, the health impacts would be similar to those found in a fossil fuel-fired electricity generating facility. As discussed in the discrete NGCC and the SCPC plant alternatives in Section 7.1.3.1.2 and Section 7.1.3.2.2, respectively, regulations restricting emissions enforced by either the EPA or delegated state agencies have reduced the potential health effects from plant emissions, but have not entirely eliminated them. These agencies also impose site-specific emission limits, as needed, to protect human health. Proper emissions controls would protect workers and the public from the harmful effects of burning the biomass fuel.

Overall, human health risks during construction and operations to occupational workers and members of the public from the combination alternative would be SMALL.

7.1.3.4.10 Environmental Justice

Potential impacts on minority and low-income populations from the construction of the NGCC plant and biomass plants components of the combination alternative would consist mostly of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts). Minority and low-income populations residing along site access roads would be directly affected by increased commuter vehicle and truck traffic. However, because of the temporary nature of construction, these effects are not likely to be high and adverse. Increased demand for rental housing during construction could cause rental costs to rise disproportionately affecting low-income populations residing in the vicinity of WF3 who rely on inexpensive housing. However, given the proximity of New Orleans and Baton Rouge metropolitan areas and their volume of temporary and permanent housing across the social economic spectrum, any upward pressure on housing expenses would not be expected to be disproportionately felt within minority or low-income populations.

Based on this information and the analysis of human health and environmental impacts presented in [Section 7.1.3.4](#) of this ER, the construction and operation of the combination alternative would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of WF3.

7.1.3.4.11 Waste Management

During the construction stage for the NGCC plant component of the combination alternative, land clearing and other construction activities would generate wastes that could be recycled, disposed of on site, or shipped to an offsite waste disposal facility. During the operations period, spent SCR catalysts, which control NO_x emissions from the NGCC plant, would make up the majority of waste generated by this alternative. These wastes would be properly managed and disposed of as hazardous or nonhazardous waste in permitted offsite facilities. Recycling and waste minimization programs such as those at WF3 would also be implemented as appropriate.

For DSM, there may be an increase in wastes generated during installation or implementation of energy conservation measures, such as appropriate disposal of old appliances, installation of control devices, and building modifications. New and existing recycling programs would help minimize the amount of generated waste.

During construction of the biomass plants component of the combination alternative, land clearing and other construction activities would generate waste that could be recycled, disposed of on site, or shipped to an offsite waste disposal facility. A biomass plant may use as fuel the residue from forest clear cut and thinning operations and timber mill operations, crop residue and MSW from nearby metropolitan areas. In addition to the gaseous emissions, ash would be generated. Waste would be handled in accordance with appropriate LDEQ regulations.

Overall, waste management impacts from the construction and operation of the combination alternative would be SMALL.

Table 7.1-1
Air Emissions from NGCC Plant Alternative

Emission	Annual Amount^(a)
Gas consumption	94.0 billion ft ³
Sulfur dioxide ^(b)	164 tons
Nitrogen oxides ^(c)	625 tons
Carbon monoxide	1,440 tons
Particulate matter	317 tons
Nitrous oxide	144 tons
Volatile organic compounds	101 tons
Carbon dioxide	5.3 million tons

(ENERCON 2015b)

- a. Based on emission factors from EPA 2000, Tables 3.1-1 and 3.1-2a.
- b. Assumes sulfur content of 3.4 percent.
- c. Assumes 90 percent conversion in SCR equipment.

Table 7.1-2
Air Emissions from SCPC Plant Alternative

Parameter	Tons/Year
Annual coal consumption	7.84 million
Sulfur oxides	2,670
Nitrogen oxides	1,410
Carbon monoxide	1,960
Filterable particulate matter	524
Particulates less than 10 microns in diameter	121
Carbon dioxide	13.7 million

(ENERCON 2015b)

Table 7.1-3
Solid Waste from SCPC Plant Alternative

Parameter	Amount
Annual SO ₂ generated subject to removal by scrubbers	61,000 tons per year
Annual SO ₂ captured	58,000 tons per year
Annual scrubber waste	158,000 tons per year
Annual scrubber waste disposed based on 90-percent recycling	15,800 tons per year
Annual ash generated	523,000 tons per year
Annual ash disposed based on 50-percent recycling	262,000 tons per year
Annual total waste disposed assuming no recycling	681,000 tons per year
Annual total waste disposed assuming recycling	277,000 tons per year
Waste pile area (40-year period) assuming no recycling	387 acres, 30 feet high
Waste pile area (40-year period) assuming recycling	167 acres, 30 feet high

(ENERCON 2015b)

Table 7.1-4
Air Emissions from NGCC Plant Combination Alternative

Emission	Annual Amount^(a)
Gas consumption	46.0 billion ft ³
Sulfur dioxide	80 tons
Nitrogen oxides	306 tons
Carbon monoxide	705 tons
Particulate matter	155 tons
Nitrous oxide	71 tons
Volatile organic compounds	49 tons
Carbon dioxide	2.6 million tons

- a. Adapted from [Table 7.1-1](#) (668-MWe NGCC plant combination alternative + 1,366-MWe discrete NGCC plant alternative × discrete NGCC plant alternative annual amount).

7.2 Alternatives for Reducing Adverse Impacts

7.2.1 Alternatives Considered

As noted in 10 CFR 51.53(c)(3)(iii), "The report must contain a consideration of alternatives for reducing adverse impacts, as required by § 51.45(c), for all Category 2 license renewal issues in Appendix B to Subpart A of this part." The review of the environmental impacts associated with the Category 2 issues required by 10 CFR 51.53(c)(3)(ii) provided in [Chapter 4](#) identified no significant adverse effects that would warrant consideration of additional alternatives to reduce or avoid those impacts. Based on the [Chapter 4](#) analysis, Entergy concludes that the impacts of renewal of the WF3 OL do not warrant additional consideration of alternatives for reducing adverse impacts, as specified in NRC Regulatory Guide 4.2, Revision 1 ([NRC 2013a](#), Section 7.2), and existing mitigation measures discussed in [Section 6.2](#) and listed in [Table 6.1-1](#) to avoid, reduce the severity of, or eliminate adverse impacts are adequate for minimizing adverse impacts.

7.2.2 Environmental Impacts of Alternatives for Reducing Adverse Impacts

As discussed in [Section 7.2.1](#) above, there were no alternatives identified by Entergy to further warrant additional consideration for reducing adverse impacts associated with the renewal of the WF3 OL.

7.3 No-Action Alternative

7.3.1 Proposed Action

The proposed action is to renew the WF3 OL, which would preserve the option for Entergy to continue to operate WF3 to provide reliable base-load power and meet future system generating needs throughout the 20-year license renewal period. The analysis of the environmental impacts required by 10 CFR 51.53(c)(3)(ii) and presented in [Chapter 4](#) identified no significant adverse effects from the continued operation of WF3 during the license renewal period.

7.3.2 No-Action Alternative

The "no-action alternative" to the proposed action is not to renew the WF3 OL. In this alternative, it is expected that WF3 would continue to operate up through the end of the existing OL, at which time plant operations would cease and decommissioning would begin ([Section 7.3.3](#)). The environmental impacts of the no-action alternative would be the impacts associated with the construction and operation of the type of replacement power utilized, such as those identified in [Section 7.1.1](#) of this ER. In effect, the net environmental impacts would be transferred from the continued operation of WF3 to the environmental impacts associated with the construction and operation of a new generating facility or a combination of facilities. Therefore, the no-action alternative would have no net environmental benefits.

The environmental impacts associated with the proposed action (continued operation of WF3) were compared to the environmental impacts from the no-action alternative (decommissioning of

WF3) and the construction and operation of other reasonable sources of electricity generation. Entergy believes this comparison shows that the continued operation of WF3 would produce no significant environmental impacts while the no-action alternative would have greater impacts than the proposed action on certain environmental resources as described in [Section 7.1.3](#).

In addition, CO₂ emissions are suspected to be a major contributor to anthropogenic GHG emissions, which some scientists believe contribute to climate change. The burning of fossil fuels (coal, natural gas, and petroleum) is the largest energy-related contributor to CO₂ emissions in the world. [Table 7.3-1](#) shows the amount of CO₂ released by the consumption of various fuel sources to produce electricity. This table illustrates that all fossil fuel-based energy sources produce GHG emissions, whereas nuclear power produces none. In addition, as previously discussed in [Section 7.1.3.3.2](#), GHG emissions associated with nuclear power are similar to the life-cycle GHG emissions from renewable energy sources. Therefore, under the proposed action, millions of tons of GHGs would be avoided, thereby resulting in a beneficial air quality impact.

7.3.3 Decommissioning Impacts

The NRC defines decommissioning as the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits (1) release of the property for unrestricted use and termination of the license, or (2) release of the property under restricted conditions and termination of the license [10 CFR 20.1003]. The NRC-evaluated decommissioning options include (1) immediate dismantling soon after the facility closes and prompt decontamination (DECON); (2) safe storage and monitoring of the facility for a period of time that allows the radioactivity to decay, followed by dismantling and additional decontamination (SAFSTOR); and (3) permanent entombment on site in structurally sound material, such as concrete, and appropriately maintained and monitored (ENTOMB). Regardless of the option chosen, decommissioning must be completed within the 60-year period following permanent cessation of operations and permanent removal of fuel.

Under the no-action alternative, Entergy would continue operating WF3 until the existing OL expires, and then initiate decommissioning activities in accordance with NRC requirements. As the GEIS notes, the NRC has evaluated environmental impacts from decommissioning. The NRC-evaluated impacts include those associated with land use, visual resources, air quality, noise, geology and soils, hydrology, ecology, historic and cultural resources, socioeconomics, human health, environmental justice, and waste management and pollution prevention. Entergy considers the NRC's evaluation of these impacts in the GEIS to be reasonably representative of actions that Entergy would perform for decommissioning of WF3. Therefore, Entergy relies on the NRC conclusions regarding environmental impacts of decommissioning WF3.

Entergy notes that decommissioning activities and their impacts are not discriminators between the proposed action and the no-action alternative. WF3 will have to be decommissioned eventually, regardless of the NRC decision on license renewal; license renewal would only postpone decommissioning for another 20 years. The NRC has established in the GEIS that the

timing of decommissioning operations does not substantially influence the environmental impacts of decommissioning.

Entergy relies on NRC findings [10 CFR Part 51, Subpart A, Appendix B, Table B-1] to the effect that delaying decommissioning until after the renewal term would have SMALL environmental impacts. The discriminators between the proposed action and the no-action alternative lie within the choice of power generation replacement options to be part of the no-action alternative.

[Section 7.1.3](#) analyzes the impacts from these options.

Entergy concludes that the decommissioning impacts under the no-action alternative would not be substantially different from those following license renewal as identified in the GEIS and in the decommissioning generic environmental impact statement. Decommissioning impacts under the no-action alternative would be temporary and could overlap with operation of a WF3 replacement.

Table 7.3-1
Carbon Dioxide Emissions from Electricity Generation

Fuel	Pounds CO₂ per Million Btu
Bituminous coal ^(a)	205
Sub-bituminous coal ^(a)	213
Lignite coal ^(a)	215
Natural gas ^(a)	117
Distillate oil (No. 2) ^(a)	161
Residual oil (No. 6) ^(a)	174
Nuclear	0
Renewable sources	0

a. (EIA 2014)

8.0 COMPARISON OF THE ENVIRONMENTAL IMPACT OF LICENSE RENEWAL WITH THE ALTERNATIVES

To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form [10 CFR 51.45(b)(3)]

The proposed action is renewal of the WF3 OL, which would preserve the option to continue to operate WF3 to provide reliable base-load power and meet Entergy's future system generating needs throughout the 20-year license renewal period. [Chapter 4](#) analyzes environmental impacts of the proposed action, and [Chapter 7](#) describes potential energy alternatives to the proposed action, and analyzes impacts from the alternatives deemed to be reasonable.

[Table 8.0-1](#) summarizes the environmental impacts of the proposed action and the alternatives deemed reasonable, for comparison purposes. [Table 8.0-2](#) provides a more detailed comparison. The environmental impacts compared in [Tables 8.0-1](#) and [8.0-2](#) are either Category 2 issues that apply to the proposed action or issues that the GEIS identified as major considerations in an alternatives analysis.

As shown in [Tables 8.0-1](#) and [8.0-2](#), there are no reasonable alternatives superior to that of the continued operation of WF3, providing approximately 1,188 MWe of reliable base-load power generation. The continued operation of WF3 would create significantly less environmental impact than the construction and operation of new alternative generating capacity. In addition, the continued operation of WF3 will have a significant positive economic impact on the communities surrounding the station, such as reduced local unemployment, economic support of surrounding communities, and lower energy costs.

**Table 8.0-1
Environmental Impacts Comparison Summary**

Impact Area ^(a)	Proposed Action	No-Action Alternative				
		Decommissioning	NGCC Plant Alternative	SCPC Plant Alternative	New Nuclear Plant Alternative	Combination of Alternatives
Land Use	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Visual Resources	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL
Air Quality	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL	SMALL to MODERATE
Noise	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL
Geology and Soils	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Surface Water	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Groundwater	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Terrestrial	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL
Aquatic	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Special Status Species	NO EFFECT	NO EFFECT	NO EFFECT	(b)	NO EFFECT	NO EFFECT
Historic and Cultural	NO ADVERSE EFFECT	NO ADVERSE EFFECT	NO ADVERSE EFFECT	NO ADVERSE EFFECT	NO ADVERSE EFFECT	NO ADVERSE EFFECT
Socioeconomics	SMALL	SMALL	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL

Table 8.0-1 (Continued)
Environmental Impacts Comparison Summary

Impact Area ^(a)	Proposed Action	No-Action Alternative				
		Decommissioning	NGCC Plant Alternative	SCPC Plant Alternative	New Nuclear Plant Alternative	Combination of Alternatives
Environmental Justice	(c)	(c)	(c)	(d)	(c)	(c)
Waste Management	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL

- a. As defined in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3:
SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.
- b. The magnitude of impacts could vary widely based on site selection and the presence or absence of special status species and habitats when the alternative is implemented; thus, Entergy cannot forecast a level of impact for this alternative.
- c. This alternative would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations in the vicinity of WF3.
- d. A definitive determination of the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations would depend on this alternative's location, plant design, and expected operations characteristics; thus, Entergy cannot forecast the effects on minority and low-income populations for this alternative.

Table 8.0-2 (Sheet 1 of 16)
Environmental Impacts Comparison Detail

Summary of Replacement Power Alternatives and Key Characteristics				
	NGCC Alternative	SCPC Alternative	New Nuclear Alternative	Combination Alternative
Summary of Alternative	Multiple combustion turbines assembled in appropriate power train configurations for a total of 1,188 net MWe.	SCPC plant with CCS for a total of 1,188 net MWe.	One unit nuclear plant for a total of 1,188 net MWe.	One NGCC plant for a total of 581 net MWe; four biomass plants for a total of 166 net MWe; and 441 MWe from DSM.
Location	At Entergy Louisiana, LLC property.	At or near an existing power plant site (other than WF3).	At Entergy Louisiana, LLC property.	At Entergy Louisiana, LLC property.
Cooling System	Closed-cycle cooling with mechanical draft cooling towers; some infrastructure upgrades may be required.	Closed-cycle cooling with mechanical draft cooling towers; some infrastructure upgrades may be required.	Closed-cycle cooling with mechanical draft cooling towers; some infrastructure upgrades may be required.	NGCC and Biomass Plants: Closed-cycle cooling with mechanical draft cooling towers; some infrastructure upgrades may be required.
Land Requirements	59 acres for the plant; potentially 4,920 acres for gas field.	115 acres for the plant; 1,350 to 30,700 acres for coal mining; 167 to 387 acres for waste disposal.	234 acres for the plant; 1,188 acres for uranium mining and processing.	29 acres for the NGCC plant; 60 acres for the biomass plants.
Workforce	1,640 during peak construction; 205 during operations.	1,680 to 3,500 during peak construction; 350 during operations.	2,100 during peak construction; 641 during operations.	800 during peak construction of NGCC plant and 100 during operations; 200 during peak construction of the biomass plants and 88 during operations.

Table 8.0-2 (Sheet 2 of 16)
Environmental Impacts Comparison Detail

Land Use	
Proposed action	SMALL: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Onsite land use Offsite land use
Decommissioning	SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	SMALL: Plant to be constructed on previously disturbed land; no encroachment into wetlands; new gas pipeline may be collocated within existing ROW; existing gas supply assumed adequate to support NGCC plant operations.
SCPC plant alternative	SMALL to MODERATE: Impacts could range from minimal, if newly disturbed land surrounding the site was previously used for industrial purposes, to noticeable, if land exceeds original footprint of the site that was previously used for non-industrial purposes; land required for coal mining and processing to support SCPC plant operations could range from 1,350 to 30,700 acres.
New nuclear plant alternative	SMALL: Plant to be constructed on previously disturbed land; no encroachment into wetlands; during operations, there would be no net change in offsite land use impacts as a result of uranium mining.
Combination of alternatives	SMALL to MODERATE: NGCC and biomass plants to be constructed on previously disturbed land; no encroachment into wetlands; new gas pipeline may be collocated within existing ROW; DSM would have little to no direct land use impacts; existing gas supply assumed adequate to support NGCC plant operations; biomass plants impact depend on characteristics of affected forested lands and effects of storing, loading, and transporting biomass feedstock.

Table 8.0-2 (Sheet 3 of 16)
Environmental Impacts Comparison Detail

Visual Resources	
Proposed action	SMALL: Adopting by reference the Category 1 issue finding for aesthetic impacts in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
Decommissioning	SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	SMALL: Construction and operations activities would appear similar to other ongoing onsite activities because the Entergy Louisiana, LLC property is already aesthetically altered by the presence of existing power plants.
SCPC plant alternative	SMALL to MODERATE: Construction activities would appear similar to other ongoing onsite activities if located near existing power plant site; cooling towers could result in a noticeable change within the viewshed of the plant if not previously present at the site.
New nuclear plant alternative	SMALL: Construction and operations activities would appear similar to other ongoing onsite activities because the Entergy Louisiana, LLC property is already aesthetically altered by the presence of existing power plants.
Combination of alternatives	SMALL: Construction and operations activities would appear similar to other ongoing onsite activities because the Entergy Louisiana, LLC property is already aesthetically altered by the presence of existing power plants; no impacts would be expected from the DSM component.

Table 8.0-2 (Sheet 4 of 16)
Environmental Impacts Comparison Detail

Air Quality	
Proposed action	SMALL: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Air quality impacts (all plants) Air quality effects of transmission lines
Decommissioning	SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	SMALL to MODERATE: Construction impacts would be temporary; emission estimates during the operations period are as follows: Sulfur dioxide = 164 tons per year Nitrogen oxides = 625 tons per year Carbon monoxide = 1,440 tons per year Particulate matter = 317 tons per year Nitrous oxide = 144 tons per year Volatile organic compounds = 101 tons per year Carbon dioxide = 5.3 million tons per year
SCPC plant alternative	SMALL to MODERATE: Construction impacts would be temporary; emission estimates during the operations period are as follows: Sulfur dioxide = 2,670 tons per year Nitrogen oxides = 1,410 tons per year Carbon monoxide = 1,960 tons per year Filterable particulate matter = 524 tons per year Particulates less than 10 microns in diameter = 121 tons per year Carbon dioxide = 13.7 million tons per year
New nuclear plant alternative	SMALL: Construction impacts would be temporary; operations impacts would be minor with emission sources operating intermittently, and emissions being maintained within federal and state regulatory limits.
Combination of alternatives	SMALL to MODERATE: Construction impacts would be temporary; emission estimates during the operations period are as follows: <u>NGCC Plant</u> Sulfur dioxide = 80 tons per year Nitrogen oxides = 306 tons per year Carbon monoxide = 705 tons per year Particulate matter = 155 tons per year Nitrous oxide = 71 tons per year Volatile organic compounds = 49 tons per year Carbon dioxide = 2.6 million tons per year <u>Biomass Plants</u> Sulfur dioxide = 1,050 tons Nitrogen oxide = 5,870 tons Carbon dioxide = 890,000 tons Air quality impacts associated with DSM would be negligible.

Table 8.0-2 (Sheet 5 of 16)
Environmental Impacts Comparison Detail

Noise	
Proposed action	SMALL: Adopting by reference the Category 1 issue finding for noise impacts in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
Decommissioning	SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	SMALL: Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations are not anticipated to be greater than those currently associated with WF3.
SCPC plant alternative	SMALL to MODERATE: Noise impacts from construction activities would be temporary and managed in accordance with local noise ordinances; depending on site location, operations noise impacts associated with rail delivery of coal and lime/limestone could be significant for residents living in vicinity of the facility and along rail route.
New nuclear plant alternative	SMALL: Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations are not anticipated to be greater than those currently associated with WF3.
Combination of alternatives	SMALL: Noise impacts from construction activities would be temporary; noise impacts during operations are not anticipated to be greater than those currently associated with WF3; no impacts would be expected from the DSM component.

Table 8.0-2 (Sheet 6 of 16)
Environmental Impacts Comparison Detail

Geology and Soils	
Proposed action	SMALL: Adopting by reference the Category 1 issue finding for geology and soils in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
Decommissioning	SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	SMALL: Construction activities would be localized and reduced with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
SCPC plant alternative	SMALL: Construction activities would be localized and reduced with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
New nuclear plant alternative	SMALL: Construction activities would be localized and reduced with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
Combination of alternatives	SMALL: Construction activities would be localized and reduced with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs; no impacts would be expected from the DSM component.

Table 8.0-2 (Sheet 7 of 16)
Environmental Impacts Comparison Detail

Surface Water	
Proposed action	SMALL: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Surface water use and quality (non-cooling system impacts) Altered current patterns at intake and discharge structures Scouring caused by discharged cooling water Discharge of metals in cooling system effluent Discharge of biocides, sanitary wastes, and minor chemical spills Surface water use conflicts (plants with once-through cooling systems) Effects of dredging on surface water quality Temperature effects on sediment transport capacity
Decommissioning	SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	SMALL: Construction impacts would be minimized through implementation of BMPs; during operations, cooling tower water consumption would be insignificant compared to the volume of water flowing in the Mississippi River; cooling water discharges would be regulated under an LPDES permit.
SCPC plant alternative	SMALL: No direct use of surface water anticipated during construction; construction impacts would be minimized through implementation of BMPs; during operations, water consumption would be comparable to a similarly sized nuclear plant; cooling water discharges would be regulated under an LPDES permit.
New nuclear plant alternative	SMALL: Construction impacts would be minimized through implementation of BMPs; during operations, cooling tower water consumption would be insignificant compared to the volume of water flowing in the Mississippi River; cooling water discharges would be regulated under an LPDES permit.
Combination of alternatives	SMALL: Construction impacts would be minimized through implementation of BMPs; during operations, cooling tower water consumption would be insignificant compared to the volume of water flowing in the Mississippi River; cooling water discharges would be regulated under an LPDES permit; no impacts would be expected from the DSM component.

Table 8.0-2 (Sheet 8 of 16)
Environmental Impacts Comparison Detail

Groundwater	
Proposed action	SMALL: Adopting by reference the Category 1 issue finding for groundwater contamination and use (non-cooling system impacts) in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. SMALL^(a) (Radionuclides released to groundwater): No tritium or plant-related gamma isotopes or hard-to-detect radionuclides have been detected since initiation of the groundwater monitoring program in 2007.
Decommissioning	SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	SMALL: During construction and operations, potable water would be supplied by a local water supply; dewatering activities, if necessary, would be regulated by an LPDES permit; BMPs would minimize impacts to groundwater quality as a result of stormwater runoff during construction and operation.
SCPC plant alternative	SMALL: During construction and operations, potable water would be supplied by a local water supply system; dewatering activities, if necessary, would be regulated by an LPDES permit; BMPs would minimize impacts to groundwater quality as a result of stormwater runoff during construction and operation.
New nuclear plant alternative	SMALL: During construction and operations, potable water would be supplied by St. Charles Parish water system whose water source is the Mississippi River; dewatering activities, if necessary, would be regulated by an LPDES permit; BMPs would minimize impacts to groundwater quality as a result of stormwater runoff during construction and operation.
Combination of alternatives	SMALL: During construction and operations, potable water would be supplied by St. Charles Parish water system whose water source is the Mississippi River; dewatering activities, if necessary, would be regulated by an LPDES permit; BMPs would minimize impacts to groundwater quality as a result of stormwater runoff during construction and operation; no impacts would be expected from the DSM component.

a. Category 2 issue requiring site-specific evaluation.

Table 8.0-2 (Sheet 9 of 16)
Environmental Impacts Comparison Detail

Terrestrial	
Proposed action	<p>SMALL: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Exposure of terrestrial organisms to radionuclides Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds) Bird collisions with plant structures and transmission lines Transmission line ROW management impacts on terrestrial resources Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)</p> <p>SMALL^(a) (Effects on terrestrial resources—non-cooling system impacts): No license-renewal-related refurbishment or construction activities identified; adequate management programs and regulatory controls in place to ensure that important plant and animal habitats are protected.</p>
Decommissioning	<p>SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.</p>
NGCC plant alternative	<p>SMALL: Impacts would be limited to previously disturbed areas during construction with appropriate BMPs implemented; wetlands would be unaffected; siting gas pipeline along existing ROWs would minimize impacts; existing gas supply assumed to be adequate; cooling tower impacts similar to other nuclear plants with cooling towers; all other operations impacts would be similar to that of the continued operation of WF3.</p>
SCPC plant alternative	<p>SMALL to MODERATE: Impacts would primarily occur from land disturbance and destruction of habitat; impacts would depend on the amount and ecological importance of directly affected habitats; land required for coal mining and processing to support plant operations could range from 1,350 to 30,700 acres; onsite temporary storage of coal, CCR, spent catalysts, and scrubber sludge would occur on previously disturbed land.</p>
New nuclear plant alternative	<p>SMALL: Impacts would be limited to previously disturbed areas during construction with appropriate BMPs implemented; wetlands would be unaffected; cooling tower impacts would be similar to other nuclear plants with cooling towers; all other operations impacts would be similar to that of the continued operation of WF3.</p>
Combination of alternatives	<p>SMALL: Impacts would be limited to previously disturbed areas during construction with appropriate BMPs implemented; wetlands would be unaffected; cooling tower impacts would be similar to other nuclear plants with cooling towers; all other operations impacts would be similar to that of the continued operation of WF3; no impacts would be expected from the DSM component.</p>

a. Category 2 issue requiring site-specific evaluation.

Table 8.0-2 (Sheet 10 of 16)
Environmental Impacts Comparison Detail

Aquatic	
Proposed action	<p>SMALL: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Entrainment of phytoplankton and zooplankton (all plants) Infrequently reported thermal impacts (all plants) Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication Effects of nonradiological contaminants on aquatic organisms Exposure of aquatic organisms to radionuclides Effects of dredging on aquatic organisms Effects on aquatic resources (non-cooling system impacts) Impacts of transmission line ROW management on aquatic resources Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses</p> <p>SMALL^(a) (Impingement and entrainment of aquatic organisms—plants with once-through cooling systems or cooling ponds): No past or current impacts identified; offshore location of CWIS minimizes fish and shellfish from entering the system as the conditions of the Mississippi River (i.e., high velocity, increased debris, shifting river bed, lack of habitat/vegetation, and reduction of food source) at the CWIS location are not easily tolerated.</p> <p>SMALL^(a) (Thermal impacts on aquatic organisms—plants with once-through cooling systems or cooling ponds): Thermal discharges meet the LDEQ's mixing zone water quality criteria of 5°F allowable rise of temperature above ambient; stretch of the Mississippi River at WF3 is not "unique" for any shellfish, fish, or wildlife; most of the cross-sectional area available for flow in the river unaffected by the thermal plume.</p>
Decommissioning	<p>SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.</p>
NGCC plant alternative	<p>SMALL: Implementation of BMPs would minimize impacts on aquatic ecosystems during construction; during operations, less cooling water would be withdrawn; discharges would be governed under an LPDES permit.</p>
SCPC plant alternative	<p>SMALL: Implementation of BMPs would minimize impacts on aquatic ecosystems during construction; during operations, less cooling water would be withdrawn; discharges would be governed under an LPDES permit.</p>
New nuclear plant alternative	<p>SMALL: Implementation of BMPs would minimize impacts on aquatic ecosystems during construction; during operations, less cooling water would be withdrawn; discharges would be governed under an LPDES permit.</p>
Combination of alternatives	<p>SMALL: Implementation of BMPs would minimize impacts on aquatic ecosystems during construction; during operations, less cooling water would be withdrawn; discharges would be governed under an LPDES permit; no impacts would be expected from the DSM component.</p>

a. Category 2 issue requiring site-specific evaluation.

Table 8.0-2 (Sheet 11 of 16)
Environmental Impacts Comparison Detail

Special Status Species	
Proposed action	NO EFFECT: No license-renewal-related refurbishment or construction activities identified; no suitable habitat identified on site for federally listed species; no species or habitats under NMFS's jurisdiction occur within the action area; management and regulatory programs in place to protect special status species.
Decommissioning	NO EFFECT: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	NO EFFECT: Construction activities to occur on already disturbed land; no suitable habitat identified on site for federally listed species; no species or habitats under NMFS's jurisdiction occur within the action area; construction of gas pipeline subject to LDEQ construction stormwater permitting requirements.
SCPC plant alternative	UNDETERMINED: Types and magnitudes of adverse impacts to ESA listed species and EFH would depend on the proposed site, plant design, operation, and listed species and habitats present when the alternative is implemented.
New nuclear plant alternative	NO EFFECT: Construction activities to occur on already disturbed land; no suitable habitat identified on site for federally listed species; no species or habitats under NMFS's jurisdiction occur within the action area.
Combination of alternatives	NO EFFECT: Construction activities to occur on already disturbed land; no suitable habitat identified on site for federally listed species; no species or habitats under NMFS's jurisdiction occur within the action area; no impacts would be expected from the DSM component.

Table 8.0-2 (Sheet 12 of 16)
Environmental Impacts Comparison Detail

Historic and Cultural Resources	
Proposed action	NO ADVERSE EFFECT: No license-renewal-related refurbishment or construction activities identified; administrative controls ensure protection of cultural resources in the event of excavation activities.
Decommissioning	NO ADVERSE EFFECT: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	NO ADVERSE EFFECT: Previously surveyed and/or disturbed areas to be utilized during construction; avoidance of significant historic and archaeological resources during operations can be effectively managed under current laws and regulations.
SCPC plant alternative	NO ADVERSE EFFECT: Land areas would be surveyed prior to construction and mitigation considered if eligible properties encountered; siting of the plant and associated cooling towers can be effectively managed under current laws and regulations.
New nuclear plant alternative	NO ADVERSE EFFECT: Previously surveyed and/or disturbed areas to be utilized during construction; avoidance of significant historic and archaeological resources during operations can be effectively managed under current laws and regulations.
Combination of alternatives	NO ADVERSE EFFECT: Previously surveyed and/or disturbed areas to be utilized during construction; avoidance of significant historic and archaeological resources during operations can be effectively managed under current laws and regulations; no impacts would be expected from the DSM component.

Table 8.0-2 (Sheet 13 of 16)
Environmental Impacts Comparison Detail

Socioeconomics	
Proposed action	SMALL: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Employment and income, recreation and tourism Tax revenues Community services and education Population and housing Transportation
Decommissioning	SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	SMALL to MODERATE: Majority of workers would reside within the region; in-migrating workers would be temporary; economic contributions locally and regionally would remain generally the same; traffic congestion during construction could be minimized but would still be noticeable; loss of jobs at WF3 and revenue contributions locally and regionally could be noticeable; traffic-related transportation impacts would be reduced after construction.
SCPC plant alternative	SMALL to LARGE: Local communities could experience a short-term economic "boom" from increased tax revenue and income; after construction, local communities could experience a return to pre-construction economic conditions; traffic-related impacts dependent on rural or urban setting; impacts could be noticeable to local communities due to the loss of tax payments to the parish's tax base; traffic-related transportation impacts would be reduced after construction.
New nuclear plant alternative	SMALL to MODERATE: Majority of construction workers would reside within the region; in-migrating workers would be temporary; economic contributions locally and regionally would remain generally the same; traffic congestion during construction could be minimized but would still be noticeable; number of operations workforce would be similar to that of WF3; could be a temporary increase in employment from decommissioning activities; property taxes would be comparable to those of WF3; traffic-related transportation impacts would be reduced after construction.
Combination of alternatives	SMALL to MODERATE: Majority of construction workers would reside within the region; in-migrating workers would be temporary; economic contributions locally and regionally would remain generally the same; traffic congestion during construction could be minimized but would still be noticeable; loss of jobs at WF3 and revenue contributions locally and regionally could be noticeable; traffic-related transportation impacts would be reduced after construction; DSM component would not have a noticeable effect on the local economy.

Table 8.0-2 (Sheet 14 of 16)
Environmental Impacts Comparison Detail

Human Health	
Proposed action	<p>SMALL: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Radiation exposures to the public Radiation exposures to plant workers Human health impact from chemicals Microbiological hazards to plant workers Physical occupational hazards</p> <p>SMALL^(a) (Public health—plants using lakes or canals, or cooling towers or cooling ponds that discharge to a river): Discharge structure design promotes rapid mixing of thermal discharges with the Mississippi River; average heated discharge flow is small compared to volume of river water flow; from 2004 to 2013, no cases of reported <i>Naegleria</i> infection attributable to Mississippi River; public restricted from discharge area.</p> <p>SMALL^(a) (Electric shock hazards): Transmission lines located entirely within Entergy Louisiana, LLC property and meet NESC's 5 mA standard; occupational safety and health measures in place to address shock hazards from overhead lines.</p> <p>SMALL^(a) (SAMA): Potentially cost-effective SAMAs are not related to adequately managing the effects of aging during the period of extended operation.</p>
Decommissioning	<p>SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.</p>
NGCC plant alternative	<p>SMALL: Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operations; air emissions would be subject to regulatory standards that are protective of human health.</p>
SCPC plant alternative	<p>SMALL: Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operations; air emissions would be subject to regulatory standards that are protective of human health.</p>
New nuclear plant alternative	<p>SMALL: Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction; human health impacts during operation would be similar to WF3.</p>
Combination of alternatives	<p>SMALL: Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operations; air emissions would be subject to regulatory standards that are protective of human health; impacts from DSM component would be minimal and localized.</p>

a. Category 2 issue requiring site-specific evaluation.

Table 8.0-2 (Sheet 15 of 16)
Environmental Impacts Comparison Detail

Environmental Justice	
Proposed action	There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the proposed action of renewing the WF3 OL.
Decommissioning	Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the construction and operation of an NGCC plant alternative.
SCPC plant alternative	Cannot forecast the effects on minority and low-income populations because the location, plant design, and expected operations characteristics are unknown.
New nuclear plant alternative	There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the construction and operation of a new nuclear plant alternative.
Combination of alternatives	There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the construction and operation of a combination of energy alternatives.

Table 8.0-2 (Sheet 16 of 16)
Environmental Impacts Comparison Detail

Waste Management	
Proposed action	SMALL: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Low-level waste storage and disposal Onsite storage of spent nuclear fuel Offsite radiological impacts of spent nuclear fuel and high-level waste disposal Mixed-waste storage and disposal Nonradioactive waste storage and disposal
Decommissioning	SMALL: Adopting by reference the Category 1 issue finding for termination of plant operations and decommissioning in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
NGCC plant alternative	SMALL: Construction-related wastes would be properly characterized and disposed of at permitted offsite facilities; spent SCR catalysts would make up the majority of the waste during operations; operations-related wastes would be managed and recycled or disposed of at permitted offsite facilities.
SCPC plant alternative	SMALL to MODERATE: Construction-related wastes would be properly characterized and disposed of at permitted offsite facilities; scrubber and ash wastes disposed of annually would total 277,000 tons if recycling options are available; without recycling, scrubber and ash wastes disposed of annually would be 681,000 tons.
New nuclear plant alternative	SMALL: Construction-related wastes would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous, hazardous, and radioactive wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.
Combination of alternatives	SMALL: Construction-related wastes would be properly characterized and disposed of at permitted offsite facilities; during operations, spent SCR catalysts would make up the majority of the NGCC plant waste, while ash would make up the majority of the biomass plants waste; operations-related wastes would be managed and recycled or disposed of at permitted offsite facilities; recycling programs would minimize DSM generated waste.

9.0 STATUS OF COMPLIANCE

The environmental report shall list all Federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The environmental report shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements which have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection. [10 CFR 51.45(d)]

9.1 WF3 Authorizations

Table 9.1-1 provides a summary of authorizations held by WF3 for current plant operations. Authorizations in this context include any permits, licenses, approvals, or other entitlements that would continue to be in place, as appropriate, throughout the period of extended operation given their respective renewal schedules. Table 9.1-2 lists additional environmental authorizations and consultations related to the renewal of the WF3 OL.

Table 9.1-1
Environmental Authorizations for Current WF3 Operations

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
CILLRWC	Omnibus Low-Level Radioactive Waste Interstate Compact Consent Act (1980 and amended in 1985)	Authorization to Export Waste	None	Updated annually	Export of LLRW outside the region
DOT	49 CFR Part 107, Subpart G	Hazardous Materials Certificate of Registration	060115551059X	June 30, 2016	Radioactive and hazardous materials shipments
LDEQ	Federal Water Pollution Control Act Section 402	LPDES Permit	LA0007374	September 7, 2015 ^(a)	Discharge of wastewaters to waters of the State
LDEQ	LAC 33:III.503	Air Permit	2520-00091-00	^(b)	Operation of air emission sources (diesel generators, diesel pumps, portable auxiliary boiler, and portable gas/diesel generators)
LDEQ	LAC 33:V.1105	Hazardous Waste Generator Identification	LAD000757450	None	Hazardous waste generation
LDEQ	LAC 33:VII.501	Industrial Solid Waste Site Identification	G-089-3276	None	Industrial solid waste generation
MEMA	Chapter 432, Laws of 1982, Mississippi Radioactive Waste Transportation Act	Radioactive Waste Transport Permit	4537	Updated annually	Transportation of radioactive waste into, within, or through the state of Mississippi

Table 9.1-1 (Continued)
Environmental Authorizations for Current WF3 Operations

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
NRC	Atomic Energy Act, 10 CFR 50	WF3 License to Operate	NPF-38	December 18, 2024	Operation of WF3
TDEC	Tennessee Department of Environment and Conservation Rule 1200-2-10-32	Radioactive Waste License for Delivery	T-LA001-L15	Updated annually	Shipment of radioactive material into Tennessee to a disposal/ processing facility

CILLRWC: Central Interstate Low-Level Radioactive Waste Commission

DOT: U.S. Department of Transportation

LDEQ: Louisiana Department of Environmental Quality

MEMA: Mississippi Emergency Management Agency

NRC: U.S. Nuclear Regulatory Commission

TDEC: Tennessee Department of Environment and Conservation

- a. Timely renewal application submitted 180 days prior to permit expiration ([Entergy 2015p](#)); therefore, permit has been administratively continued.
- b. Current air permit does not contain an expiration date. However in 2015, LDEQ promulgated amendments to LAC 33:III.503 to establish a regulatory framework setting forth maximum terms and renewal procedures for minor source air permits of not more than 10 years. Based on LDEQ's established schedule, WF3's air permit renewal application is due to the LDEQ on October 1, 2017.

Table 9.1-2
Environmental Authorizations and Consultations for WF3 License Renewal

Agency	Authority	Requirement	Remarks
U.S. Nuclear Regulatory Commission	Atomic Energy Act [42 USC 2011 et seq.]	License renewal	Applicant for federal license must submit an Environmental Report in support of license renewal application.
U.S. Fish and Wildlife Service	Endangered Species Act Section 7 [16 USC 1636]	Consultation	Requires federal agency issuing a license to consult with the USFWS, and NMFS if applicable, regarding federally protected species.
Louisiana Department of Culture, Recreation & Tourism	National Historic Preservation Act Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation officer.
Louisiana Department of Environmental Quality	Clean Water Act Section 401 [33 USC 1341]	Certification	Applicant seeking federal license for a project with discharge to state waters must obtain either State certification that proposed action would comply with applicable State water quality standards, or a waiver.
Louisiana Department of Natural Resources	Federal Coastal Zone Management Act [16 USC 1451 et seq.]	Consistency Determination	Requires an applicant to provide certification to the federal agency issuing the license that license renewal would be consistent with the federally approved state coastal zone management program.

9.2 Status of Compliance

WF3 has established control measures in place to ensure compliance with the authorizations listed in [Table 9.1-1](#), including monitoring, reporting, and operating within specified limits. WF3 chemistry personnel are primarily responsible for monitoring and ensuring that the site complies with its environmental permits and applicable regulations. Monitoring and sampling results associated with environmental programs are submitted to appropriate agencies, as specified in the permits and/or governing regulations.

9.3 Notice of Violations

Based on review of records over the previous 5 years (2010–2014) of various environmental programs and permits that WF3 is subject to and complies with, there have been no federal (i.e., agencies other than the NRC), state, or local regulatory notices of violations issued to the facility.

9.4 Remediation Activities

There are no current or ongoing remediation activities or investigations occurring at WF3.

9.5 Federal, State, and Local Regulatory Standards: Discussion of Compliance

9.5.1 Clean Water Act

9.5.1.1 Water Quality (401) Certification

Federal CWA, Section 401, requires an applicant for a federal license to conduct an activity that might result in a discharge into navigable waters to provide the licensing agency a certification, or a waiver of certification, from the state where the discharge would originate that the discharge will not violate state water quality standards [33 USC 1341]. The Louisiana Stream Control Commission issued a Section 401 State Water Quality Certification (WQC) for WF3 on June 21, 1972 ([Attachment A](#)). Correspondence from the LDEQ in January 2015 ([Attachment A](#)) confirms the following:

- No new or additional 401 WQC is required for WF3 in support of its license renewal application.
- The 401 WQC issued by the Louisiana Stream Control Commission on June 21, 1972, remains valid for WF3.
- WF3 LPDES Permit No. LA0007374 constitutes 401 WQC.

The EPA has granted Louisiana the authority to issue NPDES permits under a fully delegated NPDES program. [Attachment A](#) contains the LPDES permit that authorizes plant discharges at WF3. WF3 is providing a copy of its LPDES permit as further demonstration of the existing state water quality (401) certification.

9.5.1.2 LPDES Permit

The release of pollutants in wastewaters at the WF3 facility is regulated and controlled through LPDES Permit No. LA0007374 issued by the LDEQ. As discussed in [Section 3.5.1.1.1](#), there are 13 outfalls (3 external and 10 internal) identified in the LPDES permit. Monitoring results associated with these outfalls are submitted in discharge monitoring reports to the LDEQ at the frequency specified in the permit. WF3's compliance with the LPDES permit over the previous 5 years (2010–2014) has been excellent. For example, there has not been an exceedance relative to thermal discharge or non-related thermal discharge limits as identified in the station's LPDES permit.

9.5.1.3 Stormwater Permit

Stormwater discharges associated with WF3 industrial activities are regulated and controlled through LPDES Permit No. LA0007374 issued by the LDEQ. WF3 samples stormwater runoff at LPDES Outfall 004 (which receives runoff from the entire industrial area) on a quarterly basis and analyzes for pollutants as specified in the permit. WF3 is also required to develop, maintain, and implement a SWPPP for the facility that identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater and identify the BMPs that will be used to prevent or reduce the pollutants in stormwater discharges ([WF3 2007b](#)). WF3 is in compliance with the terms and conditions of the LPDES permit as it relates to the stormwater program.

9.5.1.4 Sanitary Wastewaters

As previously discussed in [Section 3.5.1.1.3](#), with the exception of the EEC, sanitary wastewater from all plant locations is transferred to the St. Charles Parish POTW where it is managed appropriately. Sanitary wastewater from the EEC, which is regulated by WF3's LPDES Permit No. LA0007374, flows to an onsite sewage treatment unit prior to discharging to 40 Arpent Canal via LPDES Outfall 005.

Because sanitary wastewaters at the EEC are treated in a sewage treatment unit and sanitary wastewaters are collected in sewage lift stations at the plant prior to discharge to the St. Charles Parish POTW, WF3 is required to have personnel certified in accordance with Louisiana Department of Health and Hospitals LAC 48:V.7303 (Certification Requirements). WF3 maintains onsite certified wastewater operators; therefore, the site is in compliance with this program.

9.5.1.5 Spill Prevention, Control, and Countermeasures

The EPA's Oil Pollution Prevention Rule became effective January 10, 1974, and was published under the authority of Section 311(j)(1)(C) of the Federal Water Pollution Control Act. The regulation has been published in 40 CFR Part 112 and facilities subject to the rule must prepare and implement an SPCC plan to prevent any discharge of oil into or upon navigable waters of the United States or adjoining shorelines. WF3 is subject to this rule and has a written SPCC plan that identifies and describes the procedures, materials, equipment, and facilities that are utilized

at the station to minimize the frequency and severity of oil spills in order to meet the requirements of this rule ([WF3 2015b](#)).

Reportable Spills [40 CFR Part 110]

WF3 is subject to the reporting provisions of 40 CFR Part 110 as it relates to the discharge of oil in such quantities as may be harmful pursuant to Section 311(b)(4) of the Federal Water Pollution Control Act. Any discharges of oil in such quantities that may be harmful to the public health or welfare or the environment must be reported to the National Response Center. Based on a review of records over the previous 5 years (2010–2014), there have been no releases at WF3 that have triggered this notification requirement.

Reportable Spills [LAC 33.I Chapter 39]

WF3 is also subject to the reporting provisions of Louisiana Environmental Regulatory Code, LAC 33.I Chapter 39. This reporting provision requires that any release of oil in a quantity of 42 gallons (1 barrel) or greater to the environment be reported to the Louisiana Department of Public Safety and the LDEQ. Based on a review of records over the previous 5 years (2010–2014), there have been no releases at WF3 that have triggered this notification requirement.

9.5.1.6 Facility Response Plan

WF3 is not subject to the Facility Response Plan risk requirements described in 40 CFR 112.20 because the facility does not transfer oil over water to or from vessels and does not store oil in quantities greater than 1 million gallons.

9.5.1.7 Section 404 Permit

As discussed in [Section 3.1.1](#), approximately 63 percent of the Entergy Louisiana, LLC property consists of wetlands. For these wetland areas, either a Section 404 Individual or Nationwide Permit would have to be obtained from the USACE prior to performing activities in these type areas. Although WF3's current operation does not require a Section 404 Permit, the Station would comply with regulatory requirements imposed by the USACE as it relates to performing activities in federal jurisdictional wetland areas when appropriate.

9.5.2 Safe Drinking Water Act

As discussed in [Section 2.2.2.6](#), potable water for WF3 is supplied by the St. Charles Parish Water System. No further treatment for potable water usage is performed on site. In addition, WF3 does not engage in underground injections or other actions that could endanger drinking water sources. Therefore, WF3 is not subject to the Safe Drinking Water Act.

9.5.3 Clean Air Act

9.5.3.1 Air Permit

WF3 has a permit to operate emergency diesel generators, diesel fire water pumps, diesel dry cooling tower pumps, portable auxiliary boiler, and portable outage engines ([WF3 2004a](#)). Operation of these air emission sources is maintained within the emission, opacity, fuel sulfur content, and fuel usage (as applicable) limits established in the station air permit issued by the LDEQ. As required by the air permit, reports are submitted annually and semiannually to the LDEQ. For purposes of the CAA, WF3 is considered a minor air emission source. WF3 is in compliance with this permit.

9.5.3.2 Chemical Accident Prevention Provisions [40 CFR Part 68]

WF3 is not subject to the Risk Management Plan requirements described in 40 CFR Part 68 because the amount of regulated chemicals present on site do not exceed the threshold quantities specified in 40 CFR 68.130.

9.5.3.3 Stratospheric Ozone [40 CFR 82]

Under Title VI of the CAA, the EPA is responsible for several programs that protect the stratospheric ozone layer. Regulations promulgated by the EPA to protect the ozone layer are contained in 40 CFR Part 82. Refrigeration appliances and motor vehicle air conditioners are regulated under Sections 608 and 609 of the CAA, respectively. A number of service practices, refrigerant reclamation, technician certification, and other requirements are covered by these programs. WF3 is in compliance with Section 608 of the CAA as amended in 1990 and the implementing regulations codified in 40 CFR Part 82. The program to manage stationary refrigeration appliances at WF3 is described in Entergy's fleet procedure ([Entergy 2014h](#)). Because motor vehicle air conditioners are not serviced on site, Section 609 of the CAA is not applicable.

9.5.4 Atomic Energy Act

9.5.4.1 Radioactive Waste

As a generator of both LLRW and spent fuel, WF3 is subject to and complies with provisions and requirements of the Low-Level Radioactive Waste Policy Amendment Act of 1985 and the Nuclear Waste Policy Act of 1982, as subsequently amended.

WF3 also complies with permits issued by (1) the Central Interstate Low-Level Radioactive Waste Commission for exporting radioactive waste outside the region, (2) the Mississippi Emergency Management Agency for transportation of radioactive material into, within, or through the state of Mississippi, and (3) the Tennessee Department of Environment and Conservation for shipping radioactive material to a licensed disposal/processing facility within the state of Tennessee.

9.5.5 Resource Conservation and Recovery Act

9.5.5.1 Nonradioactive Wastes

As a generator of hazardous and nonhazardous wastes, WF3 is subject to and complies with the RCRA and specific LDEQ regulations contained in LAC 33: Part V (Hazardous Waste and Hazardous Materials) and LAC 33: Part VII (Solid Waste). As discussed in [Section 2.2.4](#), WF3 is classified as a small quantity generator of hazardous wastes; therefore, hazardous wastes routinely make up only a small percentage of the total wastes generated. As a generator of hazardous wastes, WF3 also maintains a hazardous waste generator identification number ([Table 9.1-1](#)). Because WF3 is classified as a small quantity generator of hazardous waste, LDEQ regulations LAC 33:V.1111.E exempts the facility from annual hazardous waste reporting requirements.

Reportable Spills [40 CFR Part 262]

WF3 is subject to the reporting provisions of 40 CFR 262.34(d)(5)(iv)(C) as it relates to a fire, explosion, or other release of hazardous waste, which could threaten human health outside the facility boundary or when the facility has knowledge that a spill has reached surface water. Any such events must be reported to the National Response Center. Based on a review of records over the previous 5 years (2010–2014), there have been no releases at WF3 that have triggered this notification requirement.

9.5.5.2 Mixed Wastes

Radioactive materials are regulated by the NRC under the Atomic Energy Act of 1954, and hazardous wastes are regulated by the EPA under the RCRA of 1976. Although there are currently no mixed waste streams being generated or stored at WF3, the facility would comply with required NRC and EPA management practices when applicable.

9.5.5.3 Underground Storage Tanks [LAC 33:XI]

WF3 has one underground storage tank located on site at the EEC, a 550-gallon fiberglass diesel fuel oil underground storage tank. This 550-gallon tank is the fuel supply for the Emergency Operations Facility emergency generator. This tank is subject to the release response and corrective action requirements specified in LAC 33:XI.715. WF3 is in compliance with these requirements.

Reportable Spills [LAC 33:XI.715]

WF3 is subject to the reporting provisions of LAC 33:XI.715 as it relates to discovering a release of a regulated substance from an underground storage tank containing a petroleum product. Any such events must be reported to the LDEQ. There have been no releases at WF3 that have triggered this notification requirement over the previous 5 years (2010–2014).

9.5.6 Louisiana Public Health Sanitary Code

9.5.6.1 Medical Waste

Because WF3 generates small quantities of medical waste from the onsite medical clinic, the facility is subject to and complies with the requirements of Louisiana Sanitary Code, Chapter XXVII (Management of Refuse, Infectious Waste, Medical Waste, and Potentially Infectious Biomedical Waste).

9.5.7 Pollution Prevention Act

In accordance with RCRA Section 3002(b) and 40 CFR 262.27, a small or large quantity generator must certify that there is a waste minimization program in place to reduce the volume and toxicity of the waste generated to the degree determined to be economically practical. As previously discussed in [Section 2.2.4](#), WF3 is meeting this requirement as procedural measures are in place to minimize hazardous waste generated to the maximum extent practical.

9.5.8 Federal Insecticide, Fungicide and Rodenticide Act

Commercially approved herbicides such as Pramitol® and Roundup® are applied by a licensed contractor on an as-needed basis to control vegetation. Pesticides are also applied inside buildings by a licensed contractor. Fertilizers or soil conditioners are not used at WF3. ([Entergy 2009a](#), Section 4.3.1) Because only contractors who have obtained a license as specified in Louisiana Department of Agriculture and Animals LAC 7:XXIX.107 conduct pesticide/herbicide applications on site, WF3 is in compliance with the requirements of this act.

9.5.9 Toxic Substances Control Act

The Toxic Substances Control Act of 1976 regulates PCBs [40 CFR Part 761] and asbestos [40 CFR Part 763], both of which are present at WF3. PCBs are present in some lighting ballasts and large capacitors, while asbestos is present in specific types of insulation and gaskets. WF3 is in compliance with the PCB and asbestos regulations applicable to the facility.

9.5.10 Hazardous Materials Transportation Act

Because WF3 ships hazardous materials off site that are regulated by the U.S. Department of Transportation, the facility is subject to and complies with the applicable requirements of the Hazardous Materials Transportation Act described in 49 CFR, including the requirement to possess a current Hazardous Materials Certificate of Registration ([Table 9.1-1](#)).

9.5.11 Emergency Planning and Community Right-to-Know Act

9.5.11.1 Section 312 Reporting [40 CFR Part 370]

WF3 is subject to and complies with Section 312 of the Emergency Planning and Community Right-to-Know Act that requires the submittal of an emergency and hazardous chemical inventory report (Tier II) to the Local Emergency Planning Commission, the State Emergency

Response Commission, and the local fire department. This report which typically includes, but is not limited to, chemicals such as ammonium hydroxide, boric acid, carbon dioxide, diesel fuel, electrohydraulic fluid, ethylene glycol, gasoline, hydrazine, hydrogen, lube oils, Nalco products, nitrogen, sodium hydroxide, and sulfuric acid is submitted to these agencies annually.

9.5.11.2 Section 313 Reporting [40 CFR Part 372]

Because WF3 is located on the same Entergy Louisiana, LLC property as Waterford 1, 2, and 4 and the facilities are owned by the same entity, the facilities are designated as one "complex". By default, this subjects WF3 to the Section 313 Toxic Release Inventory reporting requirements. Although reporting under this requirement may not be applicable in certain calendar years given that the reporting trigger associated with this complex is either the quantity of Number 6 fuel oil combusted (5,140 gallons) at the Waterford 1, 2, and 4 facilities, or Number 2 fuel oil (1,410,000 gallons) combusted at WF3 and Waterford 4, WF3 is in compliance with the Section 313 Toxic Release Inventory reporting requirements.

9.5.12 **Comprehensive Environmental Response, Compensation, and Liability Act**

WF3 is subject to the hazardous substance release and reporting provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as subsequently amended. Any release of reportable quantities of listed hazardous substances to the environment requires a notification to the National Response Center, Louisiana Department of Public Safety, and LDEQ, and subsequent written follow-up. Based on a review of records over the previous 5 years (2010–2014), there have been no releases at WF3 that have triggered this notification requirement.

9.5.13 **Migratory Bird Treaty Act**

The Migratory Bird Treaty Act makes it unlawful to pursue, hunt, take, capture, kill, or sell birds listed and grants protection to any bird parts including feathers, eggs, and nests. There are currently no Migratory Bird Treaty Act permitting requirements associated with WF3 operations.

9.5.14 **Endangered Species Act**

Potential impacts on federally and state-listed species were considered in Entergy's review and analysis in [Section 4.6.3](#), and it was concluded that none would likely be adversely affected as a result of license renewal.

Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of species that are listed, or proposed for listing, as endangered or threatened. Depending on the action involved, the ESA requires consultation with the USFWS, and with the NMFS if marine or anadromous species could be affected. Although Entergy invited comment from the USFWS and NMFS ([Attachment B](#)) during the development of this ER, a more structured consultation process with these agencies may be initiated by the NRC per Section 7 of the ESA.

9.5.15 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act prohibits the take, transport, sale, barter, trade, import and export, and possession of eagles, making it illegal for anyone to collect eagles and eagle parts, nests, or eggs without a USFWS permit. There are currently no Bald and Golden Eagle Protection Act permitting requirements associated with WF3 operations.

9.5.16 Coastal Zone Management Act

The federal Coastal Zone Management Act [16 USC 1451 et seq.] imposes requirements on applicants for a federal license to conduct an activity that could affect a state's coastal zone. The act requires the applicant to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal zone management program [16 USC 1456(c)(3)(A)]. The National Oceanic and Atmospheric Administration has promulgated implementing regulations that indicate that the requirement is applicable to renewal of federal licenses for activities not previously reviewed by the state [15 CFR 930.51(b)(1)]. The regulation requires that the license applicant provide its certification to the federal licensing agency and a copy to the applicable state agency [15 CFR 930.57(a)].

The NRC's Office of Nuclear Reactor Regulation has issued guidance to its staff regarding compliance with the act. This guidance acknowledges that Louisiana has an approved coastal zone management program ([NRC 2013d](#), page E-3). WF3, located in St. Charles Parish, is within the Louisiana coastal zone.

Based on correspondence from the Louisiana Department of Natural Resources, the agency determined that renewal of the WF3 OL is consistent with Louisiana's coastal zone policies ([Attachment E](#)). Therefore, WF3 has fulfilled the regulatory requirement to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal zone management program.

9.5.17 Magnuson-Stevens Fishery Conservation and Management Act

WF3 is not subject to the Magnuson-Stevens Fishery Conservation and Management Act because no essential fish habitat has been designated by the NMFS within the vicinity of WF3 ([Attachment B](#)).

9.5.18 Marine Mammal Protection Act

The Marine Mammal Protection Act prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. There are currently no Marine Mammal Protection Act permitting requirements associated with WF3 operations.

9.5.19 Farmland Protection Policy Act

The FPPA only applies to "federal programs." The term "federal program" under this act does not include federal permitting or licensing for activities on private or non-federal lands. Therefore, because license renewal is considered a federal licensing activity and WF3 is located on non-federal lands, the FPPA is not applicable.

9.5.20 National Historic Preservation Act

Potential impacts on historic properties were considered in Entergy's review and analysis in [Section 4.7](#), and it was concluded that although one eligible historic property is present (Waterford Plantation), it will not be adversely affected as a result of license renewal. As previously discussed in [Section 3.7.5](#), administrative controls are in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. These controls consist of a cultural resources protection plan and procedure that requires reviews, investigations, and consultations as needed ([Entergy 2013c](#)), and a site-specific cultural resource protection plan to protect those areas on the property determined to be eligible for the NRHP, specifically the Waterford Plantation ([LP&L 1983](#)). These controls ensure that existing or potentially existing cultural resources are adequately protected, and assist WF3 in meeting state and federal expectations.

Section 106 of the NHPA requires federal agencies having the authority to license any undertaking to take into account the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking, prior to the agency issuing the license. Although Entergy invited comment from the SHPO ([Attachment C](#)) during development of this ER, a more structured consultation process with the SHPO may be initiated by the NRC per Section 106 of the NHPA.

9.5.21 State Water Use Program

In accordance with L.R.S. 38:3091-3097, the Louisiana Department of Transportation and Development requires that all major water users keep accurate records of water pumpage within their facilities and report such pumpage to the State on a quarterly basis. Entergy's New Orleans, Louisiana, fossil headquarters group reports quarterly water pumpage for several facilities, including WF3. Water pumpage is based on the monthly average flow reported in the facility's monthly discharge monitoring report. WF3 is in compliance with this reporting requirement.

9.5.22 Federal Aviation Act

Coordination with the Federal Aviation Administration (FAA) is required when it becomes necessary to ensure that the highest structures associated with the project do not impair the safety of aviation. Submission of a letter of notification (with accompanying maps and project description) to the FAA would result in a written response from the FAA certifying that no hazard exists or recommending project changes and/or the installation of warning devices such as lighting.

The site elevation is dominated by the 249.5-foot high reactor shield building (WF3 2014a, Section 3.8.4.1.1) and the 200-foot high primary and backup meteorological towers that are equipped with an FAA lighting system (Entergy 1999). No license-renewal-related construction activities have been identified; therefore, no new notifications to the FAA are required.

9.5.23 Occupational Safety and Health Act

The federal OSHA governs the occupational safety and health of the construction workers and the operations staffs. WF3 and its contractors comply with OSHA's substantive requirements, as these are incorporated in the sites occupational health and safety practices.

9.5.24 St. Charles Parish Zoning Requirements

9.5.24.1 Land Use

Section 11.5-36 of the St. Charles Parish zoning code designates the Entergy Louisiana, LLC property as an industrial area. The designated industrial area does not include the wetland areas south of LA-3127. Appendix A of the St. Charles Parish zoning code ordinance requires WF3 to maintain a buffer zone to ensure the protection and well-being of neighboring areas and that major operations must be located 2,000 feet from the nearest residential and commercial district, or located a lesser distance if clearly dictated safe by industry standards and approved by the local Board of Adjustments. (SCP 2014a) WF3 is in compliance with this zoning ordinance.

9.6 Environmental Reviews

Entergy has fleet procedural controls in place to ensure that environmentally sensitive areas at WF3, if present, are adequately protected during site operations and project planning (Entergy 2013g). These controls, which encompass nonradiological environmental resource areas such as land use, air quality, surface water and groundwater, terrestrial and aquatic ecology, historic and cultural resources, and waste management and pollution prevention consist of the following:

- Appropriate local, state, and/or federal permits are obtained or modified as necessary.
- BMPs are implemented to protect wetlands, natural heritage areas, and sensitive ecosystems.
- Appropriate agencies are consulted on matters involving federally and state-listed threatened, endangered, and protected species, and that BMPs are implemented to minimize impacts to these species.
- Appropriate agencies are consulted on matters involving cultural resources and to ensure BMPs are implemented to minimize impact to this resource.

In summary, Entergy's administrative controls ensure that appropriate local, state, and/or federal permits are obtained or modified as necessary, that cultural resources and threatened and

endangered species are protected if present, and that other regulatory issues are adequately addressed as necessary.

9.7 Requirement [10 CFR 51.45(d)]

The discussion of alternatives in the report shall include a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements. [10 CFR 51.45(d)]

The coal, gas, new nuclear, and combination of alternatives discussed in [Chapter 7](#) could probably be constructed and operated to comply with all applicable environmental quality standards and requirements. However, increasingly stringent air quality protection requirements could make the construction of a large fossil-fueled power plant infeasible in certain regional locations.

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