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10.0 Environmental Consequences of the Proposed Action

This chapter presents the potential environmental consequences of construction and operating a nuclear power generating facility at the VCS site. These environmental consequences are presented in the following three subsections:

- Unavoidable Adverse Environmental Impacts (Section 10.1)
- Irreversible and Irretrievable Commitments of Resources (Section 10.2)
- Relationship Between Sort-Term Uses and Long-Term Productivity of the Human Environment (Section 10.3)

10.1 Unavoidable Adverse Environmental Impacts

This section summarizes those unavoidable adverse impacts that could potentially result from construction and operation of VCS. Unavoidable adverse impacts are predicted adverse environmental impacts that cannot be avoided and for which there are no practical means of mitigation. This section considers unavoidable adverse impacts from VCS construction and operation and associated new transmission lines constructed and operated both in new areas and areas adjacent to existing transmission corridors. This summary also identifies reasonable and practical mitigation actions proposed to reduce the impacts. Information provided in Sections 4.6 and 5.10 was used to prepare this section.

The following categories have been assessed for unavoidable adverse impacts resulting from VCS construction and operation:

- Land use
- Hydrology and water use
- Ecology (terrestrial and aquatic)
- Socioeconomics
- Radiology
- Meteorology and atmospheric releases
- Environmental justice

10.1.1 Unavoidable Adverse Environmental Impacts of VCS Construction

The potential adverse environmental impacts from the construction of VCS are described in detail in Chapter 4. Table 4.6-1 summarizes those impacts and identifies the measures and controls that may be implemented to reduce or eliminate them. Construction-related unavoidable adverse environmental impacts (CU) are summarized in Table 10.1-1 and include the following:

Land Use

CU1. Disturbance of approximately 7129 acres composed primarily of rangeland by conversion to industrial land use, with a permanent loss of approximately 6354 acres of terrestrial habitat.

CU2. Disturbance of approximately 2809 acres for constructing new transmission line corridors. Other offsite land disturbances include 28 acres for a heavy haul road and blowdown pipeline, and 119 to 159 acres for RWMU piping.

CU3. Affected mineral rights and associated oil and gas leases would not be accessible during construction.

CU4. Trees and vegetation would be cleared during construction.

Hydrology and Water Use

CU5. Withdrawal of water from the Guadalupe River for approximately 1.5 years to fill the cooling basin.

CU6. Localized drawdown in the underlying aquifer because of groundwater consumption for construction activities.

CU7. Temporary increase in suspended solids concentration and turbidity in nearby surface waters.

CU8. Temporary sediment loading on downgradient wetlands and water bodies.

CU9. Discharge of treated sanitary wastewater could affect water quality of the Guadalupe River within a mixing zone until construction is completed.

Ecology

CU10. Permanent loss of approximately 6354 acres of habitat and wetlands.

CU11. Temporary loss of some aquatic habitat during shoreline dredging.

CU12. Displacement of birds and small mammals because of noise, with the displacement being permanent for some species.

CU13. Aquatic habitats within the footprint of the cooling basin would be destroyed or degraded by earth-moving activities, then inundated when the basin is filled.

Socioeconomic

CU14. Loss of construction jobs, population, wage income, indirect jobs and income, and sales tax revenue resulting from out-migrating workforce within the region of influence, when construction is complete.

CU15. Potential decline in residential property tax base resulting from out-migrating workforce.

CU16. Visual impacts for up to several miles from construction at the site.

CU17. Increase in traffic on local roads and Victoria County Barge Canal until construction activities cease.

CU18. Increased use of recreational facilities within a 50-mile region until construction is completed.

CU19. Exposure of construction workers to temporary elevated noise and vibration levels from construction activities.

CU20. Exposure of construction workers to temporary fugitive dust and fine particulate matter emissions from construction activities and equipment.

CU21. Exposure of surrounding population to temporary and localized noise, fugitive dust, and exhaust emissions.

CU22. Increased demand on community services and infrastructure within the region of influence from in-migration of construction workers.

Radiological

No unavoidable adverse impacts were identified.

Meteorology and Atmospheric Releases

No unavoidable adverse impacts were identified.

Environmental Justice

There would be no unusual resource dependencies by low-income or minority groups, and therefore no disproportionate unavoidable adverse impacts.

10.1.2 Unavoidable Adverse Environmental Impacts of VCS Operation

The potential environmental impacts from VCS operation are described in detail in Chapter 5. Table 5.10-1 summarizes those impacts and identifies measures and controls that may be implemented to reduce or eliminate them. The operations-related unavoidable adverse environmental impacts (OU) are summarized in Table 10.1-2 and include the following:

Land Use

OU1. Approximately 6354 acres of land would not be available until the completion of decommissioning.

OU2. Portions of approximately 2809 acres of land dedicated to new transmission line corridors would not be available.

OU3. Affected mineral rights and associated oil and gas leases would not be accessible until the completion of decommissioning.

Hydrology and Water Use

OU4. Potential hydrologic impacts from the groundwater withdrawal from the Evangeline Aquifer until VCS ceases to operate.

OU5. Water withdrawal from the Guadalupe River via the raw water makeup (RWMU) intake canal to replace water lost to evaporation, drift, seepage, and blowdown until VCS ceases to operate.

OU6. Seepage of the cooling basin would increase infiltration to the underlying Chicot Aquifer, potentially altering the natural shallow groundwater flow direction and gradient near the cooling basin, until the completion of decommissioning.

OU7. Discharges from VCS operation would affect the water quality of the Guadalupe River within a mixing zone until VCS ceases to operate.

OU8. Potential water quality impacts to streams or rivers in or near the transmission corridors resulting from the use of EPA-approved herbicides.

Ecology

OU9. Discharges from VCS operation would have physical, chemical, and thermal impacts to the aquatic resources in the Guadalupe River in a mixing zone until VCS ceases to operate.

OU10. Impingement of a small number of juvenile and adult fish in the raw water makeup system intake until VCS ceases to operate.

OU11. Entrainment of fish eggs and larvae in the raw water makeup system intake until VCS ceases to operate.

OU12. Small adverse impacts to wildlife from noise, minor shadowing, small increase in precipitation, and salt deposition from the mechanical draft cooling towers until VCS ceases to operate.

OU13. Small adverse impacts to vegetation and wildlife habitat from transmission system operation and maintenance.

OU14. Avian mortality resulting from collision with transmission lines.

Socioeconomic

OU15. Visual impacts to local landscape from reactor buildings, support facilities, mechanical draft cooling towers and associated plumes, transmission lines, and offsite facilities until the completion of decommissioning.

OU16. Electrical shock hazards, electromagnetic field exposure, and noise resulting from operation of the transmission lines.

OU17. Potential for television and radio interference from transmission lines.

OU18. Increased use of recreational facilities in the 50-mile region.

OU19. Increased demand on community services and infrastructure within the region of influence from in-migration of operations workers.

OU20. Increase in traffic on local roads at shift changes until the completion of decommissioning.

Radiological

OU21. Dose to operations workers and the public from operation of VCS until VCS ceases to operate.

OU22. Discharges of radioactive liquids and gases to the environment until VCS ceases to operate.

OU23. Generation of radioactive waste from the fuel cycle until VCS ceases to operate.

OU24. Dose to transportation workers and the public resulting from nuclear fuel transport.

OU25. Dose to workers from decommissioning of VCS.

Meteorology and Atmospheric Releases

OU26. Air emissions from auxiliary systems operated on an intermittent basis.

Environmental Justice

There would be no unusual resource dependencies by low-income or minority groups, and therefore no disproportionate unavoidable adverse impacts.

Table 10.1-1 (Sheet 1 of 4)
VCS Construction-Related Unavoidable Adverse Environmental Impacts

Category	Adverse Impacts	Mitigation Measures and Controls[(a)]	Unavoidable Adverse Impacts[(b)]
Land Use	Permanently disturbing approximately 6354 acres of an 7129 acre land disturbance.	CMC7	CU1
	Temporary disturbance of approximately 775 acres.	CMC2, CMC3	CU1
	Clearing and grubbing of trees and vegetation.	CMC1	CU4
	Excavating, backfilling, and stockpiling soils onsite.	CMC4	CU7, CU8
	Potential for erosion and sedimentation resulting from stockpiling of soils onsite.	CMC3, CMC4	CU7, CU8
	Construction of new buildings, support facilities, and impervious surfaces such as site roads.	CMC5	CU1
	Developing the site may impact federal- and/or state-listed threatened or endangered species. The white-tailed hawk, bald eagle, and wood stork have been observed on or near the site.	CMC6	None
	Constructing new transmission line corridor in area consisting primarily of pasture and cultivated crops.	CMC3, CMC10	CU2, CU8, CU11
	Construct a heavy haul road to connect the VCS site to the VCND transportation corridor.	CMC3, CMC7	CU8
	Constructing a rail spur to connect to the nearest main rail line.	CMC7	CU7
	Potential temporary impacts from ground disturbing activities during installation of underground raw water makeup (RWMU) system intake and blowdown pipelines in offsite areas.	CMC3, CMC11, CMC12	CU7
	Potential temporary impacts during ground disturbing activities within the Coastal Management Program boundary. The RWMU system intake structure and the portion of the intake pipeline would be located in the Coastal Management Program boundary.	CMC3, CMC12, CMC14	CU7, CU11
	53 historic properties that are eligible for listing on the National Register of Historic Places were identified within the visual effects areas of potential effect.	CMC15	CU16
	Thirty-six of the 53 historic properties have rural historic viewscapes and would be visually impacted by plant construction. Two additional historic properties would be visually impacted, for a total of 38 affected properties.	CMC15	CU16
	Constructing new transmission line corridor that potentially could result in some direct physical disturbance to archaeological properties.	CMC10, CMC15	None
	Not allowing the current land use of affected mineral rights and associated oil and gas leases to continue.	CMC32	CU3

Table 10.1-1 (Sheet 2 of 4)
VCS Construction-Related Unavoidable Adverse Environmental Impacts

Category	Adverse Impacts	Mitigation Measures and Controls[(a)]	Unavoidable Adverse Impacts[(b)]
Hydrology and Water Use	Cooling basin would be filled by water withdrawn from the Guadalupe River over an approximate 1.5-year period.	CMC31	CU5
	Installation of groundwater wells and use of groundwater for construction could cause drawdown in the underlying aquifer.	CMC33	CU6
	Stormwater runoff from construction areas, including transmission line construction, could adversely affect surface waters.	CMC7, CMC16, CMC17	CU7
	Shoreline construction and dredging for the blowdown line, heavy haul road, and heavy haul road bridge abutments would introduce sediment to the Guadalupe River.	CMC17, CMC18, CMC19	CU7, CU8, CU11
	Shoreline construction and dredging for the RWMU system intake pipeline could introduce sediment to the Guadalupe River.	CMC3, CMC17	CU7, CU8, CU11
	Pipeline water body crossing could adversely affect surface water.	CMC11, CMC12, CMC13, CMC14	CU7
	Discharge of treated sanitary wastewater could affect water quality of receiving water bodies.	CMC7	CU9
Ecology (Terrestrial and Aquatic)	Construction activities would result in the permanent loss of approximately 6354 acres of habitat but would not reduce the regional diversity of plants or plant communities. The loss of rangeland habitat would result in displacement of large and/or mobile terrestrial wildlife and the mortality of the smaller, less mobile species. The loss of these animals would not affect or otherwise threaten the status of regional populations of these species.	CMC1, CMC2, CMC3, CMC6, CMC13	CU10, CU11, CU12, CU13
	Displacement of birds and small mammals from noise, with the displacement being permanent for some species and temporary for others.	CMC20	CU12
	Constructing new transmission line corridors in counties that support endangered and/or threatened species.	CMC10	None
	Potential sedimentation in water bodies and wetlands resulting from earth-distributing activities and shoreline construction could temporarily eliminate some benthic macroinvertebrate habitat and temporarily degrade some fish spawning habitat.	CMC2, CMC3, CMC12, CMC17, CMC18	CU7, CU11
	Accidental spills could adversely affect groundwater, surface waters, and aquatic ecosystems.	CMC3, CMC19	None
	Blowdown pipeline water body crossing could adversely affect surface water, impacting aquatic ecosystems.	CMC2, CMC11, CMC13, CMC17, CMC18, CMC21	CU8, CU11
	Pump station and RWMU system intake pipeline water body crossing could adversely affect surface water, impacting aquatic ecosystems.	CMC3, CMC12, CMC17	CU8, CU11

Table 10.1-1 (Sheet 3 of 4)
VCS Construction-Related Unavoidable Adverse Environmental Impacts

Category	Adverse Impacts	Mitigation Measures and Controls[a]	Unavoidable Adverse Impacts[b]
Ecology (Terrestrial and Aquatic) (cont.)	Transmission line routes could require crossing of water bodies or erection of towers.	CMC3, CMC10, CMC13, CMC17	CU8, CU11
	Aquatic habitats within the footprint of the cooling basin would be destroyed or degraded by earth moving activities, then inundated when the basin and reservoir are filled.	No practical mitigation measures are possible.	CU13
Socioeconomic	Exposure of construction workers to temporary elevated noise and vibration levels from construction activities.	CMC20, CMC23	CU19
	Exposure of people living or working in the area and transient populations to temporary elevated noise levels from construction activities.	CMC20, CMC24, CMC29	CU21
	Temporarily exposing construction workers, people living or working adjacent to the construction area, and transient population to fugitive dust and fine particulate matter emissions.	CMC9, CMC29	CU20, CU21
	Temporarily exposing construction workers, people living or working adjacent to the construction area, and transient populations to exhaust emissions.	CMC9, CMC29	CU20, CU21
	Delivery of construction materials to the site and workers commuting to the site would pose the risk of vehicle accidents involving injuries and fatalities.	CMC28,CMC29	None
	Potential for occupational injuries or illnesses resulting from construction activities.	CMC25, CMC26	None
	Moderate, temporary increase in population in the six-county region of influence (ROI) resulting from in-migration of construction and indirect workers and families.	CMC27	None
	Loss of construction jobs, population, wage income, and indirect jobs and income resulting from out-migrating construction workforce as construction is completed.	CMC27	CU14
	Loss of sales tax collections resulting from out-migrating construction workforce as construction is completed.	CMC27	CU14
	Loss of sales tax collections resulting from lack of expenditures for construction-related materials and services as construction is completed.	CMC27	CU14
	Decline in the residential property tax base resulting from the departure of worker families from the ROI as construction is completed.	CMC27	CU15
	Increased traffic as a result of construction on the roads in the vicinity.	CMC8, CMC28, CMC29	CU17
	Increase in traffic resulting from the VCS workers should the need to evacuate arise.	CMC28	CU17
	Increased traffic on the Victoria Barge Canal resulting from barge deliveries of construction materials.	CMC30	CU17

Table 10.1-1 (Sheet 4 of 4)
VCS Construction-Related Unavoidable Adverse Environmental Impacts

Category	Adverse Impacts	Mitigation Measures and Controls[a]	Unavoidable Adverse Impacts[b]
Socioeconomic (cont.)	Potentially, construction noises and vibrations would adversely affect hunting on nearby properties by startling the prey, driving them to a new location, thus altering the use of the land.	CMC1, CMC20, CMC24, CMC29	CU21
	Greater use of recreational facilities within the ROI and at recreational facilities outside of the ROI, but within a 50-mile radius.	CMC27	CU18
	Construction of transmission lines could temporarily affect recreational use of the properties adjacent to the right-of-way.	CMC10, CMC27	None
	Potential shortage in housing resulting from the in-migrating population.	CMC27	None
	Potential rise in prices for existing and newly constructed housing and rental rates resulting from project-related housing demand.	CMC27	None
	Additional water demand resulting from in-migrating workers would slightly reduce the excess capacity in public water supply of the two water planning regions in the ROI.	CMC27	CU22
	Additional wastewater requiring treatment resulting from in-migrating workers' water usage would reduce excess treatment capacity across the ROI by a small amount.	CMC27	CU22
	Increase in the residents-per-police officer and residents-per-firefighter ratios in the ROI.	CMC27	CU22
	Increased student enrollment in Independent School Districts in the ROI that is within the cumulative capacity of the ROI's schools.	CMC27	CU22
	Increased public transportation usage.	CMC27, CMC28	CU22
	Increased demand for medical services.	CMC27	CU22
Radiological	Potentially exposing remaining construction workers to radiation after first unit becomes operational. Estimated dose would be within public dose criteria of 10 CFR 20, 10 CFR 50, and 40 CFR 190.	No mitigation measures are required.	None
Meteorology and Atmospheric Releases	No adverse impacts were identified.	No mitigation measures are required.	None
Environmental Justice	No disproportionally high and adverse impacts to low-income or minority groups were identified.	No mitigation measures are required.	None

(a) Construction-related mitigation measures and controls (CMC) were taken from Table 4.6-1.
(b) Construction-related unavoidable adverse Impacts (CU) are listed in Subsection 10.1.1.

Table 10.1-2 (Sheet 1 of 5)
VCS Operation-Related Unavoidable Adverse Environmental Impacts

Category	Adverse Impacts	Mitigation Measures and Controls[(a)]	Unavoidable Adverse Impacts[(b)]
Land Use	Approximately 6354 acres of land would be dedicated to the plant use.	No practical measures of mitigation.	OU1
	Approximately 2809 acres of land would be dedicated to the new transmission line corridor.	No practical measures of mitigation	OU2
	Impacts of salt deposition and shadowing from the plant cooling tower operation.	No mitigation would be required.	None
	Not allowing affected mineral rights and associated oil and gas leases to continue.	OMC1	OU3
	Potential impacts to historic resources resulting from VCS operation and the transmission lines. Visual impacts to offsite historic facilities from the ability to see the structures and cooling tower plumes of VCS.	OMC2	OU15
	Commitment of small amounts of land for waste burial during decommissioning.	No mitigation would be required.	None
	Impacts from land disposal of nonradioactive solid wastes.	No mitigation would be required.	None
	Operation of the units will result in generation of mixed waste, which is regulated as both radioactive waste and hazardous waste.	OMC11	None
	Impacts to land use from fuel cycle. Total annual land requirements for fuel cycle support would be about 462 acres, 53 acres of which would be permanently committed.	No mitigation would be required.	None
Hydrology and Water Use	Potential localized hydrologic impacts from the withdrawal of groundwater from the Evangeline Aquifer.	OMC3	OU4
	Water withdrawal from the Guadalupe River to replace water lost to evaporation, drift, seepage, and blowdown.	OMC4	OU5
	Seepage from the operation of the cooling basin would increase infiltration to the underlying Chicot Aquifer, which could alter the natural shallow groundwater flow direction and gradient near the cooling basin.	No practical measures of mitigation.	OU6
	Potential impacts to water quality of the Guadalupe River from discharges from the VCS cooling basin.	OMC5	OU7
	Potential impacts to water quality of surface water because of increased volume of stormwater resulting from new impervious surfaces.	OMC10	None

Table 10.1-2 (Sheet 2 of 5)
VCS Operation-Related Unavoidable Adverse Environmental Impacts

Category	Adverse Impacts	Mitigation Measures and Controls[(a)]	Unavoidable Adverse Impacts[(b)]
Hydrology and Water Use (cont.)	Potential water quality impacts to surface water and groundwater from spills of chemicals or petroleum products.	OMC6	None
	Potential water quality impacts to streams or rivers in or near the transmission corridors resulting from the use of EPA-approved herbicides.	OMC13	OU8
	Potential impacts to water resources from fuel cycle. Total annual water use for the fuel cycle would be 4.66×10^{10} gallons.	No mitigation would be required.	None
Ecological (Terrestrial and Aquatic)	Impacts (thermal, chemical, and physical) to the Guadalupe River and its aquatic life resulting from blowdown from the VCS cooling basin.	OMC5	OU9
	Impingement of a small number of juvenile and adult fish at the raw water makeup (RWMU) system intake.	OMC8	OU10
	Fish eggs and larvae entrainment at the RWMU system intake.	OMC8	OU11
	Potential impacts to vegetation and terrestrial wildlife in the area resulting from atmospheric effects from operations of the cooling towers. Operation of the cooling towers could lead to minor shadowing, very small increase in precipitation, no noticeable increases in ground-level humidity in the immediate vicinity, and salt deposition that is a fraction of the level needed to have visible effects on vegetation.	No mitigation would be required.	OU12
	Potential impacts to wildlife from noise from the cooling towers. Noise from the cooling towers would be less than the level the NRC considers of small significance.	No mitigation would be required.	OU12
	Potential impacts to vegetation and wildlife habitat from transmission system operation, which include corridor maintenance and transmission line use relative to terrestrial ecosystems.	OMC7	OU13
	Avian mortality resulting from collision with transmission lines.	OMC12	OU14
	Potential water quality impacts and subsequent impacts to aquatic populations from maintenance of transmission lines that lie at or near water bodies and wetlands.	OMC13	OU13
Socioeconomic	Operations-related population increase of the six-county region of influence of less than 2%.	OMC16	None
	Limited development would result in minimal changes in the area's basic land use pattern resulting from the operations-related population.	No practical mitigation measures are possible.	None
	Noise impacts resulting from the operation of plant systems including the cooling towers. Noise levels would be below 65 dBA.	No mitigation would be required.	None

Table 10.1-2 (Sheet 3 of 5)
VCS Operation-Related Unavoidable Adverse Environmental Impacts

Category	Adverse Impacts	Mitigation Measures and Controls[a]	Unavoidable Adverse Impacts[b]
Socioeconomic (cont.)	Visual impacts to landscape from reactor buildings, cooling towers and associated plumes, and offsite facilities.	OMC2, OMC18	OU15
	The increased traffic resulting from these commuters would increase the risk of vehicle accidents (assuming one outage per year) involving injuries and fatalities. Additional injuries were estimated to be less than 14 annually.	OMC17	OU20
	Increased traffic on area roadways resulting from operations and outage workers commuting to VCS.	OMC17	OU20
	Impact to worker health resulting from occupational injuries and illnesses. Total recordable cases of occupational injuries and illnesses estimated per year for the onsite worker population of VCS is less than three cases based on historical incident rates at Exelon facilities.	OMC19	None
	Impacts to members of the public resulting from the operation and maintenance of the transmission system may occur as visual impacts, electric shock hazards, electromagnetic field exposure, noise impacts, or radio and television interference.	OMC14	OU16, OU17
	Potential health impact to members of the public from contact with human disease-causing thermophilic microorganisms in the cooling basin and at the Guadalupe River from the blowdown.	OMC5, OMC9	None
	Physical structures and infrastructure of VCS onsite and offsite (e.g., intake structure) as well as operational activities would produce visual and physical impacts for recreational facilities in the vicinity.	OMC18	OU15
	Potential impact to housing market affecting prices and rents.	OMC16	OU19
	Greater use of recreational facilities within the ROI and at recreational facilities outside of the ROI, but within a 50-mile radius.	OMC16	OU18
	Impacts to local wastewater treatment systems could occur because the population would increase from the in-migration of operations-related workers and their families.	OMC16	OU19
	Additional water demand resulting from operations-related population would slightly reduce the excess capacity in public water supply of the two water planning regions in the ROI.	OMC16	OU19
	Potential impact to medical services in Victoria County resulting from medical service needs of operations-related population, but within capacity.	OMC16	OU19
	Impact to schools resulting from operations workforce increasing the student population.	OMC16	OU19

Table 10.1-2 (Sheet 4 of 5)
VCS Operation-Related Unavoidable Adverse Environmental Impacts

Category	Adverse Impacts	Mitigation Measures and Controls[(a)]	Unavoidable Adverse Impacts[(b)]
Socioeconomic (cont.)	Potential impact to police and fire department services in the ROI resulting from small increases in the ratio of persons to police and firefighters over preconstruction levels. The ratio would be less than that during the construction period, which could lead to the dismissal of officers and firefighters hired to provide services at that time of higher population.	OMC16	OU19
Radiological	Potential health impacts to workers from radiation exposure will be in accordance with 10 CFR 20 and 10 CFR 50 Appendix I criteria.	None required.	OU21
	Potential health impacts to fuel cycle workers caused by radiation exposure. The estimated occupational dose (to all fuel cycle workers cumulatively) is approximately 2500 person-rem per year.	No practical mitigation measures are possible.	OU23
	Potential health impacts to transportation workers and members of the public caused by radiation exposure resulting from the loading, unloading, and transport of radioactive materials associated with the fuel cycle. The estimated collective dose to workers and the public from transportation associated with the fuel cycle is 10.0 person-rem per year. For comparative purposes, the estimated collective dose from natural background radiation to the population within 50 miles of VCS is 75,000 person-rem per year.	No practical mitigation measures are possible.	OU24
	Potential health impacts to members of the public from exposure to radiological releases. Modeling using the design and operational parameters of VCS results in estimated doses to the public that are within the design objectives of 10 CFR 50 Appendix I and within regulatory limits of 40 CFR 190.	No practical mitigation measures are possible.	OU21
	Potential health impacts to members of the public from radioactive effluents from the fuel cycle. The estimated whole-body population dose commitment to the U.S. population would be approximately 1600 person-rem per year.	No practical mitigation measures are possible.	OU21
	Potential environmental impacts from disposal of radioactive wastes generated as a result of the fuel cycle.	No practical mitigation measures are possible.	OU23
	Potential health impacts to members of the public and workers caused by exposure to radiation emitted during incident-free transportation of radiological materials during operation and decommissioning. Shipments would be less than the one per day condition of 10 CFR 51.52.	OMC15	OU24
	Potential impact to worker health resulting from occupational exposures. Experience with decommissioned power plants has shown that the occupational exposures during the decommissioning period are comparable to those associated with refueling and plant maintenance when a plant is operational.	No practical mitigation measures are possible.	OU25

Table 10.1-2 (Sheet 5 of 5)
VCS Operation-Related Unavoidable Adverse Environmental Impacts

Category	Adverse Impacts	Mitigation Measures and Controls[(a)]	Unavoidable Adverse Impacts[(b)]
Radiological (cont.)	Radiological impacts from the transport of materials removed during decommissioning to their disposal sites. The expected impact from this transportation activity would not be significantly different from normal operations.	No practical mitigation measures are possible.	OU24
Atmospheric and Meteorological	Noise, salt deposition, minor shadowing, and a very small increase in precipitation from the cooling tower operation. Noise levels 400 feet from the cooling towers are estimated to be less than 65 dBA, a level characterized by the NRC in NUREG-1555 as of small significance. Salt deposition of less than the amount necessary to result in damage to vegetation.	No practical means of mitigation.	OU12
	Potential visual impacts from cooling tower plumes. Operation of the cooling towers would result in plumes that could occur in each direction of the compass and would spread out, reducing the time that the plume would be visible from any particular location.	No mitigation would be required.	OU15
	Potential impacts to air quality from limited, short-term operation of auxiliary systems.	No practical means of mitigation.	OU26
	Potential impacts to air and water quality from fuel cycle. Gaseous effluents would be less than 0.14% of all 2005 US SO_2 emissions and less than 0.029% of all 2005 US NO_x emissions. Milling process chemical effluents are not released in quantities sufficient to have significant impacts on the environment.	No practical means of mitigation.	OU22
Environmental Justice	No disproportionately high and adverse impacts to low-income and minority populations.	No mitigation would be required.	None

(a) Operations-related mitigation measures and controls (OMC) were taken from Table 5.10-1.
(b) Operations-related unavoidable adverse impacts (OU) are listed in Subsection 10.1.2.

10.2 Irreversible and Irretrievable Commitments of Resources

This section identifies and describes the predicted irreversible and irretrievable commitment of resources that would be involved with the construction and operation of VCS. The term “irreversible commitment of resources” applies to environmental resources that could not be altered at some later time by practical means to restore the resource’s present state before construction of VCS. “Irretrievable commitment of resources” applies to material resources that, when used by construction or operation of VCS, cannot by practical means be recycled or restored for other use. This section will summarize the predicted irreversible and irretrievable commitments of resources which will be input in the final benefit-cost balancing of the project.

10.2.1 Irreversible Commitments of Environmental Resources

In the construction and operation of any electric generating station, few environmental resources are irreversibly committed to the facility beyond its operational life. The irreversible commitments of resources resulting from the construction and operation of VCS are in the areas of land use, hydrology and water use, terrestrial and aquatic ecological resources, socioeconomics, radiological releases, and atmospheric releases and meteorological changes. The resource commitments are discussed in the following subsections.

10.2.1.1 Land Use Commitments

The new units and their supporting facilities would be located on the approximately 11,500-acre VCS site in Victoria County, Texas (Figure 2.1-1). The land is currently classified as rangeland, forest land and wetland (Table 2.2-1). Construction would occur on land that has not been previously disturbed. Most of the dedicated acreage is rangeland. Approximately 6354 acres of the 7129 acres disturbed during the pre-construction and construction periods would be permanently dedicated to the new units, their supporting facilities and the cooling basin.

Once VCS ceases operations and the plant is decommissioned in accordance with NRC requirements, the land that was dedicated to the new units and their supporting facilities could be used for future industrial or nonindustrial use. The blowdown pipeline between the cooling basin and the Guadalupe River could be removed, restoring this offsite land for uses that were previously precluded by the pipeline easements. The blowdown discharge structure at the Guadalupe River could also be removed and the area restored. Offsite water conveyance facilities and structures (e.g., the pump station on the Guadalupe River and the associated water pipeline) could be used to serve other water needs.

Other offsite facilities and structures would support VCS construction or operation. The existing barge facility on the Victoria Barge Canal that would be improved to facilitate construction and operation of VCS would continue to support regional transportation needs through the operational life

of the plant and after decommissioning. The VCND transportation corridor would remain in place as part of the regional transportation infrastructure. The rail spur connecting VCS to the Union Pacific rail line could remain for future use once VCS is decommissioned or be removed.

Finally, the land committed to the disposal of radioactive and nonradioactive wastes generated as a result of construction and operation of VCS would be governed by the applicable regulations and permits and could not be used for other purposes. The land used for disposal, while not available for other uses, is not considered irreversible since it could be reclaimed for future use.

10.2.1.2 **Hydrology and Water Use Commitments**

As discussed in Chapter 3, the VCS closed-cycle cooling system would require makeup water to the cooling basin to replace water lost to evaporation, seepage, and blowdown. The source of this makeup water would be the Guadalupe River via the RWMU Intake Canal. The portion of the water pumped to the cooling basin that would be lost to evaporation, or some seepage would be made unavailable as a river resource; however, the portion of the water pumped to the cooling basin and subsequently released as blowdown and some seepage would be returned to the river.

Other plant systems would use groundwater from onsite wells. Once the groundwater is extracted from the aquifer, it is consumed or discharged to the cooling basin making it unavailable as a future groundwater resource. Water resources consumed during normal operation of VCS would not be readily available as a future resource, but should not affect the overall availability of water resources for the area. The water stored in the cooling basin could be returned to the river once VCS is decommissioned or could be used for other purposes.

10.2.1.3 **Ecological Commitments (Terrestrial and Aquatic)**

There would be impacts to vegetation and temporary relocation of terrestrial wildlife due to construction and operation of VCS. A suitable habitat for most of the species affected is available adjacent to the VCS site and in the region.

Approximately 775 acres disturbed during construction for temporary construction facilities and activities would be restored and could be available as a habitat upon completion of construction. The cooling basin could become a habitat for water birds and serve as an aquatic habitat. The decommissioning of VCS would result in restoration of the area.

Construction of the cooling basin would require alteration of the landscape. All aquatic habitats within the approximately 5785-acre footprint of the cooling basin would be eliminated or degraded by earth-moving activities. The cooling basin could support aquatic life; however, due to the high summer water temperatures possible in portions of the basin, it would be expected to primarily support thermally tolerant aquatic communities. In addition, aquatic resources such as benthic

organisms, fish, and shellfish would be lost as a result of impingement and entrainment at the RWMU intake structure during filling of the basin and reservoir and operation of VCS. However, as discussed in Section 5.3, impingement and entrainment would not endanger regional populations, due to the common nature of the potentially affected species in southeastern Texas. Additionally, no aquatic species of concern (i.e., listed as state or federally threatened or endangered) and no critical habitats have been identified on the VCS site, or in the Guadalupe River near the site. The decommissioning of VCS could eventually result in restoration of the area with the possible exception of the water conveyance facilities.

10.2.1.4 **Socioeconomics**

The effect of the construction and operation of the new units would be to increase employment and to provide positive input to the local community in the form of taxes.

The social and economic impacts resulting from VCS plant construction and operation are SMALL because the large existing inventory of vacant housing in the ROI is sufficient for the in-migrating workforce, the current capacity of existing public services would not be burdened by the in-migrating workforce, and the projected maximum student enrollment associated with VCS represents about one-third of the ROI's excess capacity. The additional law enforcement and fire protection personnel and equipment needed to support the in-migrating workers during VCS plant operation and future non-VCS-related population growth in the ROI would most likely continue to be used. Therefore, there would be no irreversible commitment of resources from a socioeconomic standpoint once the decommissioning of the new units is complete.

10.2.1.5 **Radiological Releases**

The new units would operate under the limitations imposed by NRC with respect to radioactive releases. Decommissioning would also be performed according to the requirements of NRC, which would ultimately be expected to result in the unrestricted use of the site. Therefore, the operation of the new units would not result in irreversible environmental changes to the area due to radiological releases.

10.2.1.6 **Air Emissions and Meteorological Changes**

There would be no major releases of pollutants to the atmosphere from operation of the new units, because use of equipment utilizing fossil fuels that would generate such pollutants is intermittent and limited (e.g., for testing, startup and shutdown, or actuation during a loss of offsite power or station blackout event). Upon decommissioning of the new units, these potential impacts would cease. Therefore, the operation of ancillary equipment associated with the new units would result in negligible irreversible air emissions.

The operation of the cooling basin has the potential to impact the local meteorology. However, these impacts are expected to be limited to the immediate vicinity of the basin. Therefore, operation of the cooling basin associated with the new units would not result in irreversible long-term meteorological changes to the area.

10.2.2 **Irretrievable Commitments of Material Resources**

Construction of VCS requires large quantities of building materials that would be considered irretrievable commitments of resources unless they are recycled when the plant is decommissioned. Construction materials used for VCS would be similar to those for any major, multi-year construction project. Unlike the earlier generation of nuclear plants, asbestos and other materials considered hazardous would not be used, if possible, or would be used sparingly, in accordance with safety regulations and practices. The following is a list of the major construction materials that would be required and the estimated quantities needed for construction of two representative ESBWR units at the VCS site:

- 710,000 cubic yards of concrete
- 142,000 tons of rebar for the reactor buildings
- 12,600,000 linear feet of cable
- 491,000 linear feet of piping greater than 2.5 inches in diameter

Except for the quantity of rebar for the reactor buildings, the estimated quantities are consistent with the quantities presented in the Department of Energy Report (DOE Sep 2004).

The amounts would not be atypical of other types of power plants such as hydroelectric and coal-fired plants, or of many large industrial facilities (e.g., manufacturing plants) that are constructed throughout the United States. Use of construction materials in the quantities associated with those expected for a nuclear power plant, while irretrievable unless they are recycled at decommissioning, would have a SMALL impact with respect to the availability of such resources.

During operations, the main resource irretrievably committed would be the uranium used in the fuel cycle. VCS would require about 3898 metric tons of uranium over an assumed 40-year operating life for a two unit conventional advanced LWR plant. Uranium is a metal nearly as common as tin or zinc, and it is a constituent of most rocks and of the sea (WNA Mar 2007). The known uranium resources and the current and projected demand for uranium is assessed biennially in a joint effort by the Organisation for Economic Co-Operation and Development Nuclear Energy Agency and the International Atomic Energy Agency and the results published in what is known as the “Red Book” (OECDNEA/IAEA 2008). The Red Book forecasts the world’s identified uranium resources of

5,468,800 metric tons would be sufficient for about 100 years of reactor supply at the 2006 usage rate of 66,500 metric tons. These projections do not consider uranium savings that could be achieved by specifying lower tails assays or using MOX fuel, or by the deployment of advanced reactor and fuel cycle technologies. Large stocks of uranium, previously dedicated to military applications, have become available for commercial applications. Highly enriched uranium and natural uranium held in various forms by the military sector could meet the demand for natural uranium in commercial applications for several years. The current production of uranium is less than demand due to secondary sources such as the conversion of weapons materials. Market forces will spur increased exploration and development of production capacity as the material currently available from the military sector is used. Known uranium resources will increase as the price increases and there should be sufficient long-term availability of reasonably priced uranium to supply both existing and future reactors. The World Nuclear Association (WNA) also studies supply and demand of uranium, applying market value considerations to its forecast. The WNA concludes that a 70-year supply of uranium is available based on the 2006 usage rate of 66,500 metric tons and the world's measured uranium resources (the amount known to be economically recoverable from ore bodies) of 4,700,000 metric tons (WNA Mar 2007). The VCS uranium consumption over the operating life of the plant represents less than 0.1% of the world uranium resources. Therefore, the uranium that would be used by VCS to generate power, while irretrievable, would have a SMALL impact with respect to the long-term availability of uranium worldwide.

10.2.3 **References**

DOE Sep 2004. U.S. Department of Energy, *Application of Advanced Construction Technologies to New Nuclear Power Plants,* MPR-2610, Revision 2, September 24, 2004.

OECDNEA/IAEA 2008. Organisation for Economic Co-Operation and Development Nuclear Energy Agency/International Atomic Energy Agency, *Uranium 2007: Resources, Production, and Demand*, 2008.

WNA Mar 2007. World Nuclear Association, *Supply of Uranium*, March 2007, available at http://www.world-nuclear.org/info/inf75.html, accessed November 6, 2007.

10.3 Relationship Between Short-Term Uses and Long-Term Productivity of the Human Environment

This Environmental Report focuses on the analysis and resulting conclusions associated with the environmental and socioeconomic impacts arising from activities during construction and operation of VCS. For the purpose of this section, “short-term” represents the period from start of construction to the end of station life, including prompt decommissioning. "Long-term” represents the period extending beyond the end of station life, including the period up to and beyond that required for decommissioning. This section includes an evaluation of the extent to which the short-term uses preclude options for future use of the VCS site.

10.3.1 Construction of VCS and Short-Term Uses

Section 10.1 summarizes the potential unavoidable adverse environmental impacts of construction of VCS and the measures proposed to reduce those impacts. There are adverse environmental impacts that would remain after all practical measures to avoid or mitigate the impacts have been taken. However, none of these impacts represent a long-term effect that would preclude any options for future use of the VCS site.

VCS would be located on an approximately 11,500-acre site in Victoria County, Texas. Approximately 6354 acres of the 7129 acres, disturbed during the preconstruction and construction periods, would be dedicated to the new electricity generation units, their supporting facilities, and the cooling basin. Activities currently associated with this site are cattle grazing and a limited amount of oil and gas production. During construction and operation of VCS, the land would not be available for these uses; however, these activities represent only a small portion of such activities in the region. Upon completion of construction, the remaining areas would be restored and available for use. Decommissioning of VCS would likely result in release of the area for unrestricted use. However, the water conveyance facilities may continue to be used to support non-VCS related uses.

Some construction activities will increase the ambient noise levels in the vicinity of the VCS site. However, upon completion of these activities, the ambient levels will be reduced to the levels associated with the operation of VCS and will be further reduced after plant decommissioning is completed. The workforce will be protected by adherence to the OSHA requirements for noise levels. There will be no effects on the long-term productivity of the VCS site as a result of these noise-related impacts.

Construction-related traffic has the potential to cause congestion in the immediate area of the VCS site and potentially cause deterioration to some of the roads. Potential mitigation measures including upgrades to intersections, staggering work shifts, and public notification of traffic congestion should reduce construction-related traffic congestion.

Construction of the VCS would be beneficial to the local area through the generation of new construction-related jobs, local spending by the construction workforce, and payment of taxes to the area. The adverse socioeconomic impacts that occur as a result of increased population and construction activities will cease once construction is complete and the workforce leaves the area. Benefits from increased tax revenues would persist into the foreseeable future.

The construction of the VCS will not affect short-term uses of the environment.

10.3.2 Operation of VCS and Long-Term Productivity

Section 10.1 summarizes the potential unavoidable adverse environmental impacts of operation of VCS and the measures proposed to reduce those impacts. There are adverse environmental impacts that would remain after all practical measures to avoid or mitigate the impacts have been taken. However, none of these impacts represent a long-term effect that would preclude any options for future use of the VCS site.

At the end of station life, the VCS site would be decommissioned using an approved decommissioning method as required by the NRC and the site would be available for future industrial or nonindustrial use with the possible exception of the water conveyance facilities. The offsite land that would be used for the blowdown discharge pipeline and rail spur would also be available for future industrial or nonindustrial use. The maximum long-term impact to productivity would result if the station and its support structures are not dismantled at the end of the period of station operation, and consequently the land occupied by these structures would not be available for other uses.

Operation of VCS would require water resources. The water used in plant operations would be groundwater pumped from onsite wells. The makeup water for the cooling basin would be withdrawn from the Guadalupe River via the RWMU Intake Canal. Short-term impacts to water resources as a result of the operation of VCS would be SMALL. Upon decommissioning of the site, use of local water resources for the purposes of supporting VCS would cease. Therefore, the use of water resources supporting operation of VCS would not impact the long-term productivity of the site.

Operation of VCS would require the consumption of nonrenewable resources, as described in Subsection 10.2.2. Consumption of these materials would cease upon decommissioning and does not affect the future productivity of the VCS site.

The operation of fossil fuel-fired combustion equipment (e.g., auxiliary boiler and diesel generators) would result in air emissions during the operation of VCS. Air quality impacts would be small because this equipment would be operated infrequently. Additionally, the predicted salt deposition from operation of the mechanical draft cooling tower banks at locations away from the immediate vicinity of the cooling towers would be less than the NUREG-1555 significance level where visible effects to

vegetation may be observed. Once the units cease to operate and are decommissioned, impacts to air would cease. No future issues for the long-term uses of the site would result from the impacts of increased air emissions.

Chemical effluents would be released to the Guadalupe River, in compliance with a Texas Pollutant Discharge Elimination System wastewater discharge permit. As described in Subsection 5.3.2, the releases would not adversely affect the Guadalupe River water quality during the operation of VCS. After decommissioning is complete, releases to surface waters would cease.

Impacts due to radiological emissions would be SMALL because the operation of VCS would be in accordance with NRC regulations, which restrict liquid and gaseous effluent releases. Once VCS ceases to operate and is decommissioned, radiological releases would cease. Activities associated with decommissioning would reduce contamination to levels that meet appropriate NRC release criteria. No future issues associated with the radiological emissions from operation of VCS would affect the long-term uses of the VCS site.

Spent nuclear fuel would be disposed at a repository, such as the candidate repository at Yucca Mountain, Nevada (Subsection 5.7.1.6). However, the spent nuclear fuel may be stored temporarily on the site, such as in the spent fuel pool or an independent spent fuel storage installation. This portion of the site would be unavailable for future use until the spent fuel is transported offsite.

Socioeconomic changes brought about by the operation of VCS, such as additional local infrastructure, would persist after decommissioning. Property taxes paid by Exelon to Victoria County would provide significant revenues that would benefit the county for the foreseeable future, and could support greater county infrastructure and social service improvements. The population of the six-county region of influence (Section 2.5) would increase during the life of the station and would use the services provided as a result of VCS-related tax revenues. Much of Victoria County is in agricultural use and provides little tax revenue to support county infrastructure and services. Therefore, taxes paid to Victoria County would have a long-term positive effect on the productivity of the county.

The operation of VCS will not affect long-term productivity of the environment.

10.3.3 Summary of Relationship Between Short-Term Uses and Long-Term Productivity

The negative impacts of local use of the human environment by the installation, operation, and decommissioning of VCS are summarized in terms of the unavoidable adverse environmental impacts of construction and operation in Section 10.1. The irreversible and irretrievable commitments of environmental resources associated with the project are summarized in Section 10.2. Except for the consumption of nonrenewable resources during the construction and operation of VCS, the land

committed for waste burial and possibly the land associated with the water conveyance structures, these impacts may be classified as short-term. Impacts resulting from land-use preemption by station structures can be eliminated by removing these structures or by converting them to other productive uses.

The principal short-term benefit resulting from the construction and operation of VCS is production of electricity and associated enhancement in regional economic productivity. The regional productivity resulting from the additional electricity produced by VCS would be expected to result in a correspondingly large increase in regional long-term productivity that would not be equaled by any other long-term use of the site.

In conclusion, the negative aspects of VCS construction and operation, as they affect the human environment, are outweighed by the positive long-term enhancement of regional productivity through generation of electricity.

10.4 Benefit-Cost Balance

In accordance with 10 CFR 52.17(a)(2) and 10 CFR 51.50 (b)(2) as assessment of benefits is not required in an ESP application.