4.0 ALTERNATIVES

We evaluated alternatives to the Carthage to Perryville Pipeline Project to determine whether they would be reasonable and environmentally preferable to the proposed action. We considered the no action or postponed-action alternative, system alternatives, major route alternatives, route variations, and aboveground facility site alternatives. Identification of alternatives to the proposed Project incorporated public comments and input received from federal, state, and local regulatory agencies.

We used the following evaluation criteria to determine whether or not alternatives would be environmentally preferable:

- significant environmental advantage over the proposed Project;
- ability to meet the proposed Project objectives; and
- technical and economic feasibility and practicability.

CEGT participated in the FERC's Pre-Filing Process during the preliminary design stage for the Carthage to Perryville Project. This process emphasizes identification of potential stakeholder issues early in the development of a project and identification and evaluation of alternatives that may avoid or minimize these issues. As CEGT conducted preliminary analyses of possible routes, it identified issues of concern, and multiple stakeholders provided CEGT and the FERC with comments as route planning progressed.

4.1 NO ACTION OR POSTPONED ACTION ALTERNATIVE

The Commission has three alternative courses of action in processing an application for a Certificate: 1) grant the Certificate with or without conditions, 2) deny the Certificate, or 3) postpone the action pending further study.

CEGT's objective for the proposed Project is to provide the pipeline capacity needed to connect new domestic, onshore natural gas supplies with markets in the Midwest and Northeastern regions of the United States that can be accessed through interconnects with existing pipeline infrastructure. Specifically, the proposed Project would facilitate the transport of natural gas received from the Barnett Shale and Bossier Sand production areas in eastern Texas, as well as the Elm Grove and Vernon Field production areas in Louisiana, to these markets through interconnects with four existing interstate pipeline systems. CEGT believes that the additional supply of new domestic onshore natural gas at the proposed interconnect locations would help satisfy the increasing demand for natural gas supply in the Midwest and Northeast markets.

As discussed in Section 1.1, nationwide consumption of natural gas is projected to increase more than 20 percent by 2025, and natural gas derived from domestic sources will account for the majority of the total United States consumption (EIA 2006a). By 2025, natural gas demand in the Northeast and Midwest regions is projected to increase by 13 and 25 percent, respectively (EIA 2006b). Onshore production of natural gas from unconventional sources (e.g., shale, tight sands, and coal bed methane) is expected to be a major contributor to future domestic natural gas supplies (EIA 2006a). The proposed Project would supply up to 1.2 Bcf/d of natural gas from unconventional sources (i.e., Bossier Sand and Barnett Shale fields). Although not currently a component of the proposed Project, the proposed Project route would also facilitate access and transport of natural gas from the Elm Grove and Vernon gas fields in Louisiana to markets in the Midwest and Northeast with minimal additional infrastructure improvements.

If the FERC denies CEGT's application, the short- and long-term environmental impacts identified in this EIS would not occur. If the Commission postpones action on the application, the environmental impacts identified in this EIS would be delayed, or if CEGT decided not to pursue the Project, the impacts would not

occur at all. However, if the FERC were to select the no action or postponed action alternatives, the objectives of the proposed Project would not be met, and CEGT would not be able to provide a new source of natural gas to markets that can be accessed through the proposed pipeline interconnects.

Although it would be purely speculative and beyond the scope of this analysis to attempt to predict what actions might be taken by policymakers or end users in response to the no action or postponed action alternatives, it is likely that potential end users would make other arrangements to obtain natural gas service (e.g., LNG-derived natural gas or non-LNG derived natural gas from another project), or make use of alternative fossil-fuel energy sources (e.g., fuel oil or coal), other traditional long-term fuel source alternatives (e.g., nuclear power or hydropower), and/or renewable energy sources, such as wind power, to compensate for the reduced availability of natural gas that would be supplied by the proposed Project. It is also possible that energy conservation practices would be used to offset the demand for natural gas in the markets that would be supplied by the proposed Project.

Denying or postponing a decision on the proposed Project would result in reduced natural gas availability in the targeted market regions. Such shortages would in turn lead to an increased reliance on fuel oil and other non-renewable fuel supply sources for power generating facilities. However because petroleum product consumption is also projected to increase (EIA 2006a), it is unlikely that fuel oil would provide a readily available or cost-effective alternative to natural gas. Further, natural gas is the cleanest burning of the fossil fuels. Relative to natural gas, reliance on coal or fuel oil to power electric generation would likely result in greatly increased emissions of pollutants, such as NO_x, SO_2, and carbon dioxide, and associated reductions in air quality. In addition, increased reliance on other fossil fuels would also result in secondary impacts associated with their production (e.g., coal mining and oil drilling), transportation (e.g., oil tankers, rail cars, and pipelines), and refinement.

Other long-term fuel source alternatives to natural gas include nuclear power, hydropower, and the development of renewable energy sources. Although there has recently been renewed interest in nuclear power production, growth in nuclear generating capacity will only account for about 10 percent of total United States generating capacity by 2019, and is expected to remain at that level through 2030 (EIA 2006a). Additionally, regulatory requirements, cost considerations, and public concerns make it unlikely that new nuclear power plants would be sited and developed to serve the markets targeted by the proposed Project within a timeframe that would meet the objectives of the proposed Project. The EIA (2006a) does not anticipate that any new nuclear power plants will begin operation before 2014.

Renewable energy projects and energy conservation measures will likely play an increasingly prominent role in meeting the United States' energy demands in the coming years. Though efficiency upgrades at existing hydropower facilities are expected to produce incremental additions of power production in the coming years, it is unlikely that new and/or significant sources of hydropower would be permitted and brought online as reliable, energy source alternatives to the proposed Project. Federal, state and local initiatives will likely contribute to an increase in the availability and cost-effectiveness of non-hydropower renewable energy sources such as wind, solar, tidal, geothermal, and biomass. For example, state and local initiatives have increased the availability of wind power-derived energy to local consumers in Texas (Texas Renewable Energy Industries Association 2006), and renewable energy is playing a larger role in the Mid-Atlantic and Northeast regions of the United States (CSC 2004; New York State Energy Research and Development Authority 1999). Still, the percentage of electricity generated from non-hydropower renewable energy sources at the national level is only projected to increase to 3.2 percent by 2025 (EIA 2006a), which would offset only a small part of the projected national energy demands.

In light of the preceding analysis, we do not recommend the no action or the postponed action alternative.

4.2 SYSTEM ALTERNATIVES

System alternatives are alternatives to the proposed action that would make use of other existing, modified, or proposed pipeline systems to meet the stated objectives of the proposed Project. A system alternative would make it unnecessary to construct all or part of the proposed Project, although some modifications or additions to other existing pipeline systems may be required to increase their capacity. These modifications or additions would result in environmental impacts that may be less than, similar to, or greater than those associated with construction of the proposed Project. The purpose of identifying and evaluating system alternatives is to determine whether or not potential environmental impacts associated with construction and operation of the proposed facilities would be avoided or reduced by using another pipeline system while still meeting the objectives of the proposed Project.

The analysis below examines the existing and proposed natural gas systems that currently or would eventually serve the markets targeted by the proposed Project, and considers whether those systems would meet the proposed Project objectives while offering an environmental advantage over the proposed Project. Specifically, the system alternatives considered in our analysis include:

- expansion of existing overland natural gas pipeline systems (Existing Pipeline System Alternatives); and
- construction of other natural gas pipeline systems (New Pipeline System Alternatives).

4.2.1 Existing Pipeline System Alternatives

Two existing pipeline systems operated by Gulf South and CEGT traverse the geographic area of the proposed Project. The Gulf South and CEGT System Alternatives examine the use of Gulf South and CEGT's existing pipeline systems to accommodate the 1.2 Bcf/d transport capacity of the proposed Carthage to Perryville Project.

4.2.1.1 Gulf South System Alternative

Gulf South currently operates an interstate pipeline system in Texas, Louisiana, Mississippi, Alabama, and Florida. The existing Gulf South system includes pipeline facilities extending from the Carthage Hub in Carthage, Texas, to near Delhi, Louisiana. The Gulf South pipeline transports gas from the Barnett Shale and Bossier Sand gas fields and is interconnected with several interstate pipelines. In recent filings with the FERC, Gulf South has stated that its existing pipeline system is fully subscribed as a result of the increased natural gas production in north-central and eastern Texas and increased natural gas demand from markets in the Gulf, Midwest, Southeast and Northeast regions. The Gulf South System Alternative would therefore be unable to meet the capacity volumes of the proposed Carthage to Perryville Project without substantial system upgrades, such as new or increased compression and new pipeline looping.

We have not analyzed the extent of pipeline capacity improvement that would be required in detail. However, transport and delivery of the proposed Project's volumes would require looping the entirety of the existing Gulf South pipeline between Carthage, Texas, and the Delhi, Louisiana, with approximately 190 miles of new pipeline, plus an undetermined amount of additional compression. Figure 4.2.1-1 depicts the location of the Gulf South System Alternative in relation to the proposed Project route. Assuming a standard 100-foot-wide construction right-of-way, such a pipeline would impact more than 2,300 acres of land including residential areas, wetlands, and many perennial waterbodies. In addition, the construction and

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Figure 4.2.1-1
Gulf South System Alternative

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operation of new or additional compression horsepower would result in increased air and noise emissions. Thus, the potential environmental impacts associated with the Gulf South System Alternative would likely be similar to or greater than that associated with construction and operation of the proposed Carthage to Perryville Project.

Although it would potentially complement the transport capacity proposed by CEGT, as well as offer an alternative to that capacity in the near term, we note that Gulf South has not proposed expansion of its existing pipeline system. Rather, Gulf South has recently proposed construction and operation of a new interstate natural gas pipeline project, the East Texas Expansion Project, which is considered in Section 4.2.2 below. Additionally, we do not consider the Gulf South System Alternative to provide environmental benefits superior to the proposed Project, and we have eliminated it from further consideration.

4.2.1.2 CEGT Pipeline System Alternative

CEGT currently operates an interstate pipeline system in Texas, Louisiana, Oklahoma, and Arkansas, segments of which extend from near Carthage, Texas, to Delhi, Louisiana. As with the Gulf South System Alternative, CEGT indicates that it's existing system would have to be expanded and modified to transport the 1.2 Bcf/d capacity of the proposed Project. The CEGT Pipeline System Alternative was therefore evaluated to determine whether expansion of CEGT's existing system would be environmentally preferable to the proposed Project.

In order to provide firm transport capacity for an additional 1.2 Bcf/d of natural gas, CEGT indicated that expansion of its existing system would require looping of 188 to 192 miles of existing pipeline, as well as the addition of horsepower at two or three existing compressor stations. Figure 4.2.1-2 depicts the location of the Gulf South System Alternative in relation to the proposed Project route. While much of the new pipeline would likely be collocated with existing CEGT rights-of-way, construction of this length of pipeline looping within an assumed nominal construction right-of-way width of 100 feet would impact more than 2,275 acres of land, including wetlands and surface waters. Thus, the potential environmental impacts associated with the CEGT Pipeline System Alternative would likely be similar to or greater than that associated with construction and operation of the proposed Carthage to Perryville Project.

In developing the proposed Carthage to Perryville Project, CEGT deliberated a variety of non-environmental considerations and determined that construction and operation of a new system would offer advantages in meeting its proposed objectives. Additionally, we do not consider the CEGT Pipeline System Alternative to be environmentally preferable to the proposed Project, and we have eliminated it from further consideration.

4.2.2 New Pipeline System Alternatives

4.2.2.1 East Texas Expansion Project System Alternative

Gulf South has recently proposed to construct and operate an interstate pipeline that would also traverse northern Louisiana in the general vicinity of the proposed Carthage to Perryville Project. We are currently evaluating the East Texas Expansion Project (Docket No. PF06-17-000) under our pre-filing environmental review process. The East Texas Expansion Project, as proposed, would include approximately 146 miles of new 42-inch-diameter pipeline that would be constructed largely within existing Gulf South rights-of-way between Keatchie and Delhi, Louisiana (Figure 4.2.2-1). The project would also involve the addition of 26,830-hp of compression to an existing compressor station in Carthage, Texas, and the construction of a new compressor station (39,990-hp) in Ouachita Parish, Louisiana. If approved and constructed, the East Texas Expansion Project would provide transport capacity for up to 1.5 Bcf/d of natural

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Figure 4.2.1-2
CEGT Pipeline System Alternative

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Figure 4.2.2-1
East Texas Expansion Project System Alternative

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gas to national markets that can be accessed through interconnects with the Texas Gas, ANR, and Columbia Gulf pipeline systems. Due to its proximity to the proposed Carthage to Perryville Project and proposed interconnects with the existing interstate pipeline infrastructure, the East Texas Expansion Project would potentially serve the same markets targeted by the Carthage to Perryville Project. We have therefore examined a system alternative based on the East Texas Expansion Project alignment (East Texas Expansion System Alternative).

The East Texas Expansion System Alternative would be approximately 26 miles shorter than the proposed Project alignment, but it would traverse the same general area as the proposed Project. Though selection of this system alternative would decrease the total facility requirements, it would not eliminate the need for major construction activities in wetlands, waterbodies and other sensitive environments. Land requirements for compressor stations and other aboveground ancillary facilities would also be similar to the proposed Project. Because of the similar scope and magnitude of the East Texas Expansion System Alternative, it is anticipated that construction and operational impacts would be similar to the proposed Project. Table 3.13.1-1 compares the facility requirements and associated impacts for the East Texas Expansion Project and the proposed Project.

Ultimately, the FERC does not consider the proposed Project and the East Texas Expansion Project as true alternatives to one another. Rather we view the two projects to be potentially complementary for the purpose of meeting the projected energy demands of the United States. Each pipeline project would undergo an independent environmental review process designed to ensure that potential environmental impacts resulting from their development are avoided, minimized, and/or mitigated. Although both the East Texas Expansion and Carthage to Perryville Projects would interconnect with existing interstate pipeline systems that would serve broader national markets, both would also target regional markets. As a result, it is likely that market forces, which include considerations for environmental impacts and associated permitting time and mitigation costs, will ensure that the pipeline project or projects that would ultimately be developed offer the optimal combination of environmental and financial benefits while being consistent with sustainable development in the region for which they are proposed.

4.2.2.2 Single Pipeline System Alternative

In addition to examination of a system alternative based on the East Texas Expansion Project pipeline alignment, we also evaluated a Single Pipeline System Alternative. Under this alternative, we examined the feasibility of replacing the Carthage to Perryville and East Texas Expansion Project pipelines proposed by CEGT and Gulf South, respectively, with a single pipeline that would transport the combined volumes of both projects. Adoption of the Single Pipeline System Alternative would result in the need for only a single pipeline right-of-way across northern Louisiana, rather than the two separate rights-of-way proposed by CEGT and Gulf South, which would likely result in corresponding reductions in land requirements and associated environmental effects. However, the feasibility of the Single Pipeline System Alternative would be constrained by multiple factors.

First, the separate points of origin for the Carthage to Perryville and East Texas Expansion Projects (see Figure 4.2.2-1) would limit the feasibility of the Single Pipeline System Alternative to that distance where the two pipelines would be located adjacent to one another (i.e., through Bienville, Jackson, Ouachita, and Richland Parishes, Louisiana). Thus, the Single Pipeline System Alternative would not entirely preclude the need for two pipelines. A single, 42-inch-diameter pipeline would also be incapable of delivering up to 2.7 Bcf/day of natural gas (the approximate combined volume of the two projects) without significant amounts of additional compression (beyond that proposed by either CEGT or Gulf South), significant

looping,[1] and/or an increase in pipeline diameter. Construction of additional compressor stations or expansion of existing stations would result in environmental impacts that would not occur with the proposed Project. Extensive looping of the Single Pipeline System Alternative would essentially result in the creation of two, parallel pipelines, which would offer no significant environmental advantage over the individual projects, as proposed. An increase in pipeline diameter would likely delay CEGT's proposed in-service date and result in unmet customer demand, as the lead time for production of greater diameter pipe would be greater. Additionally, the Single Pipeline System Alternative would have the added disadvantage of being potentially less reliable than installation of two pipelines, and would increase the chance of supply disruptions associated with maintenance activities or failure of a single pipeline system. Further, an increase in pipeline diameter would reduce the length of an achievable HDD and generally increase the potential for frac-outs, which would likely result in increased impacts to waterbodies and areas of forested wetlands that would be avoided by the proposed Project. Multiple technical operational issues, such as differences in customer deliveries and managing daily and hourly pipeline pressures, would also have to be resolved before a jointly owned pipeline system would be efficiently operated and administered by the two pipeline companies.

We have received no proposal from CEGT, Gulf South, or any other project sponsor to construct a pipeline system of the capacity required for the Single Pipeline System Alternative. For the reasons noted above, we believe that even if both projects were built, the Single Pipeline System Alternative would not represent a reasonable alternative, and we have eliminated it from further consideration.

4.3 MAJOR ROUTE ALTERNATIVES

We considered major route alternatives to determine if these alternatives would avoid or reduce impacts on environmentally sensitive resources that would be crossed by the proposed pipeline and in response to suggestions by the public. The origin and delivery points of a major route alternative are generally the same as for the corresponding portion of a proposed pipeline. However, the alternatives would follow routes significantly different from the proposed pipeline. Major route alternatives would not modify or make use of other existing or new pipeline systems.

Commission regulations (18 CFR 380.15[d][1]) give primary consideration to the use, enlargement, or extension of existing rights-of-way to reduce potential impacts on sensitive resources. Installation of new pipeline along existing, cleared rights-of-way (such as pipelines, powerlines, roads, and railroads) may be environmentally preferable to construction along new rights-of-way, and construction effects and cumulative impacts can normally be reduced by use of previously cleared rights-of-way. Long-term or permanent environmental impacts can be reduced by avoiding the creation of new rights-of-way through undisturbed areas.

We considered three major route alternatives to the proposed Carthage to Perryville Project route: the Gulf South Route Alternative, the CEGT North Alternative, and the CEGT South Alternative. Each of these major route alternatives is summarized in Table 4.3-1 and discussed further below.

[1] A loop is a segment of pipeline that is usually built adjacent to another pipeline and is connected to it at both ends.

TABLE 4.3-1
Comparison of Route Alternatives to the Proposed Carthage to Perryville Project

Comparative Category	Unit	Proposed Route[a]	Gulf South Route Alternative	CEGT North Route Alternative	CEGT South Route Alternative
Facility Requirements					
Pipeline length	miles	171.9	206.1	218.3	216.3
Compressor station requirements	hp/ number	41,240/ 2 new	36,670/ 2 new, 2 expanded	36,100/ 1 new, 3 expanded	38,600/ 2 new, 2 expanded
Land Requirements[b]					
Construction right-of-way	acres	2,083.6	2,498.2	2,646.1	2,621.8
Permanent right-of-way	acres	1,250.0	1,498.9	1,587.6	1,573.1
Environmental Considerations					
Waterbody crossings[c]	number	126	128	156	153
Wetlands crossed[c]	miles	0.9	2.3	2.4	3.3
Federal lands crossed	miles	0.0	3.1	2.0	2.0

Notes:
[a] Values reported are based on published data and mapping; therefore the values shown may differ from actual values provided elsewhere in this document.
[b] Land requirements reported assume a 100-foot-wide construction right-of-way and a 60-foot-wide permanent right-of-way.
[c] Based on interpretation of U.S. Geological Survey topographic maps; number of blue-line stream crossings and cumulative distance of wetland symbology crossings (National Wetland Inventory mapping is not available).

4.3.1 Analysis of Major Route Alternatives

At our request, CEGT evaluated a route alternative (the Gulf South Route Alternative) that would generally follow the existing Gulf South pipeline alignment between Carthage, Texas, and Delhi, Louisiana. Additionally, CEGT evaluated two route alternatives (the CEGT North and CEGT South Route Alternatives) that would generally follow segments of existing CEGT pipeline alignments between the proposed Project origin and terminus points. The Gulf South Route Alternative would be almost entirely collocated with or parallel to the existing Gulf South pipeline right-of-way, and the CEGT North and CEGT South Route Alternatives, would collocate with or parallel existing CEGT pipeline rights-of-way for most of their length.

CEGT estimated that the Gulf South Route Alternative (Figure 4.3.1-1) would require the construction of approximately 180.6 miles of 42-inch-diameter mainline pipeline and approximately 25.5 miles of lateral pipeline. Similarly, the CEGT North Route Alternative (Figure 4.3.1-2) would require the construction of approximately 188.1 miles of 42-inch-diameter mainline pipeline and approximately 30.2 miles of lateral pipeline, while the CEGT South Alternative (Figure 4.3.1-3) would require the construction of approximately 194.5 miles of 42-inch-diameter mainline pipeline and approximately 21.8 miles of lateral pipeline. CEGT indicates that these pipeline laterals would be required to facilitate potential future access to natural gas supplies in the Elm Grove and Vernon gas fields of Louisiana, which CEGT identified as an objective of the proposed Project. CEGT also indicated that adoption of either route alternative would require the addition of a combined total of more than 36,000 hp of compression through a combination of new compressor station construction and expansion of existing facilities (see Table 4.3-1).

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Figure 4.3.1-1
Gulf South Route Alternative

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Figure 4.3.1-2
CEGT North Route Alternative

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Figure 4.3.1-3
CEGT South Route Alternative

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Relative to the proposed Project, and as described in Table 4.3-1, each of the major route alternatives evaluated would entail construction of at least 30 additional miles of pipeline, which would likely result in greater land requirements than the proposed Project and associated environmental consequences. Each of the route alternatives would also result in between two and 30 additional waterbody crossings and significantly greater wetland impacts than the proposed Project (Table 4.3-1). Additionally, the more northerly alignment of the route alternatives in Ouachita Parish, Louisiana, would also result in a crossing of the D'Arbonne National Wildlife Refuge. With the exception of a small FWS conservation easement managed by the North Louisiana National Wildlife Refuge (see Sections 3.8 and 4.4.4), the proposed Project route would avoid impacts to any federal lands. Further, a pipeline constructed along the proposed Project route would require much shorter lateral pipelines to access the Elm Grove and Vernon gas fields, which would also likely result in reduced land requirements and associated environmental consequences. Though the proposed Project would require more total compression horsepower than any of route alternatives, we have already determined that the air and noise emissions associated with the proposed Project would be less than significant (see Section 3.11).

We generally prefer to site pipelines within or adjacent to existing rights-of-way to minimize the need to create new corridors and to avoid imposing impacts in new areas. Though the Gulf South, CEGT North, and CEGT South Route Alternatives would collocate with existing pipeline rights-of-way for most of their length, our analysis indicates that the construction and operational impacts associated with these route alternatives would be greater than or similar to the proposed Project. Additionally, the proposed Project pipeline route would parallel existing utility rights-of-way for approximately 41 miles, or about 24 percent of the proposed route. For these reasons, we do not consider that any of the major route alternatives evaluated in our analysis would offer significant environmental advantages over the proposed Project route, and we have eliminated them from further consideration.

4.4 ROUTE VARIATIONS

Route variations differ from system or major route alternatives in that they are identified to resolve or reduce construction impacts to localized, specific resources such as cultural resource sites, wetlands, recreational lands, residences, landowner requests, and terrain conditions. While route variations may be a few miles in length, most are relatively short and in proximity to the proposed route. Because route variations are identified in response to specific local concerns, they are usually the result of landowner comments. However, a variety of factors are considered in identifying and evaluating route variations, including length, land requirements, and potential for reducing or minimizing impacts to natural resources.

As part of its Project development and route selection process, CEGT identified a total of 22 miscellaneous minor route variations to the initially planned route that have been incorporated into the proposed Project route, as filed with the FERC. These minor variations were developed based on discussions with landowners, resource stewards and project engineers to avoid or minimize impacts to natural or cultural resources, reduce or eliminate engineering and constructibility concerns, and/or avoid or minimize conflicts with existing or proposed residential and agricultural land uses. Each of these miscellaneous minor route variations are summarized in Table 4.4-1 and depicted in the figures provided as Appendix H of this EIS. We have evaluated each of these minor route variations and considered their associated environmental consequences as part of our environmental analysis of the proposed Project provided in Section 3.0.

In addition to the miscellaneous minor route variations described above, we also identified five route variations in response to public comments received during the pre-filing and scoping periods. Table 4.4-2 lists these route variations, the segments of the proposed project route that they would replace, and the reason for the proposed variation. Each route variation considered was compared to the corresponding segment of the proposed Project route to determine whether potential environmental benefits would be afforded. Our

evaluation of route variations was based upon information provided by CEGT, comments filed with the FERC, a review of aerial photography and USGS topographic maps, and site visits performed by the FERC staff.

TABLE 4.4-1
Miscellaneous Minor Route Variations Adopted for the Proposed Carthage to Perryville Project

Minor Route Variation	County/Parish	Milepost Range	Reason for Incorporation
Duke/Enbridge Reroute	Panola, TX	1.0 to 2.6	Avoid an existing well pad
West Side of Sabine River Reroute	Panola, TX	2.6 to 4.1	Avoid an existing well pad, access road, and pipelines
Sabine River Reroute	Panola, TX	3.9 to 5.8	Avoid a potential archaeological resources
Gibbs Reroute	Panola, TX	7.1 to 8.3	Avoid existing residences
John Gin Road Reroute	Caddo, LA	15.3 to 17.0	Avoid a residence and pond crossing
Little Creek Reroute	Caddo, LA	17.1 to 17.7	Eliminate a stream crossing
Keatchie #1 Reroute	Caddo, LA	20.5 to 21.5	Avoids an existing residence
Estes Reroute	Caddo, LA	21.6 to 22.3	To address landowner requests
Keatchie #2 Reroute	Caddo, LA	22.6 to 23.0	Eliminate multiple stream crossings
Keatchie #3 Reroute	Caddo, LA	23.3 to 23.9	Eliminate multiple stream crossings
Boy Scout Camp/Ben Land Reroute	DeSoto, LA	24.6 to 29.2	Avoid an existing campground, planned development, pond, and existing structures
Sand Bayou Reroute	DeSoto, LA	32.0 to 34.9	Eliminate a stream and pond crossing
Frierson Reroute	DeSoto, LA	35.5 to 37.3	Eliminate a stream and pond crossing
Clear Lake Reroute	Red River, LA	39.3 to 46.1	To address landowner requests
Red River Reroute	Red River, LA	48.6 to 52.7	Adjust river crossing alignment to facilitate HDD crossing and associated setup and pipe string pullback
Gulf South/Brian's Cemetery Reroute	Bienville, LA	61.2 to 64.4	Avoid several existing features, including a cemetery, sand pit, pond and well pads
Neal Reroute	Bienville, LA	71.8 to 72.4	Avoid a pond crossing
Freyer/Sixmile Creek Reroute	Bienville, LA	78.0 to 80.6	Eliminates a stream crossing and avoid a potential archaeological site
Dugdemona Reroute	Jackson, LA	93.7 to 95.5	Eliminate multiple stream crossings
Jonesboro Reroute	Jackson, LA	96.0 to 97.5	Avoid pipeline route through an existing residential area
Kelly Road Reroute	Jackson, LA	100.5 to 100.9	Avoid a residence
Pond Reroute	Jackson, LA	106.5 to 108.0	Avoid a pond and an existing meter station
Ouachita Reroute	Ouachita Parish, LA	130.5 to 133.7	Avoid a stream crossing and address landowner requests
Rice Field Reroute	Richland, LA	138.9 to 143.1	To address landowner requests
Richland Reroute	Richland, LA	149.3 to 162.0	To reduce stream crossings and address landowner requests

TABLE 4.4-2 Summary of Route Variations Identified in Response to Public Comments Received for the Proposed Carthage to Perryville Project			
Route Variation	**Proposed Route Mileposts (approximate)**	**Reason for Variation**	**Analysis in Section Noted**
Alexander Farms	12.7 to 14.9	Minimize impacts to the Alexander Farms property	4.4.1
Young/Southern Touch	45.2 to 50.0	Avoid or minimize impacts to the Young/Southern Touch property	4.4.2
Garner	101.5 to 101.9	Avoid or minimize impacts to the Garner property	4.4.3
Sartor	145.8 to 147.2	Minimize impacts to a conservation easement held by the U.S. Fish and Wildlife Service	4.4.4
Shelton	162.1 to 167.4	Avoid or minimize impacts to the Shelton property	4.4.5

In addition to the route variations considered below, it is anticipated that minor alignment shifts would be required prior to and during construction to accommodate currently unforeseeable site-specific constraints related to engineering, landowner, and environmental concerns. All such alignment shifts would first be subject to post-Certificate review and approval by the FERC

4.4.1 Alexander Farms Route Variation

During the scoping period for the proposed Project, we received a comment from a landowner that expressed concerns the proposed Project route would traverse the center of their farm and would potentially disrupt dairy operations there. The Alexander Farms Route Variation was developed in response to that comment. The Alexander Farms Route Variation would diverge from the proposed Project route for approximately 2.4 miles between MP 12.7 and 14.9 in Panola County, Texas (see Figure 4.4.1-1). The Alexander Farms Route Variation would not eliminate impacts to the Alexander Farms property. However, it would shift the pipeline route toward the northern end of the property.

Relative to the proposed Project, the Alexander Farms Route Variation would increase the total pipeline length by about 0.1 mile and increase the construction right-of-way land requirements by about 1.2 acres. Both the proposed Project route and the Alexander Route Variation would primarily be sited through existing agricultural pastureland, though both would also traverse about 0.6 mile of cut-over pine plantation. Neither the proposed Project route nor the Alexander Route Variation would require construction within 800 feet of any residence or other structure. However, based on review of the USGS topographic maps and aerial photography, the route variation would potentially avoid two stream crossings.

While it would result in a minor increase in construction-related land requirements and associated temporary impacts, adoption of the Alexander Farms Route Variation would potentially eliminate two stream crossings. Further, it does not appear that the Alexander Farms Route Variation would result in an increase in the number of affected landowners. Therefore, **we recommend that:**

- **CEGT should adopt the Alexander Farms Route Variation rather than following the proposed Project route between MP 12.7 and MP 14.9.**

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Figure 4.4.1-1
Alexander Farms Route Variation

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4.4.2 Young/Southern Touch Route Variation

During the scoping period for the proposed Project, we received a comment from a landowner that expressed concerns the proposed Project route would conflict with future development plans for his property. CEGT identified a route variation, the Young/Southern Touch Route Variation, that would eliminate impacts to this property. The route variation would diverge from the proposed Project route at MP 45.2, circumvent the Young/Southern Touch Property, and rejoin the proposed Project route at approximately MP 50.0 (see Figure 4.4.2-1).

The Young/Southern Touch Route Variation would be about 0.1 mile longer than the proposed Project route and increase the construction right-of-way land requirements by about 1.2 acres. Both the proposed Project route and the Young/Southern Touch Variation would primarily be sited through cotton and soybean fields. However the proposed Project route would be sited closer to the edges of existing fields and would traverse less than 0.1 miles of forest land. The proposed Project route and the Young/Southern Touch Variation would both result in impacts to one wetland and one perennial stream.

Although it does appear that the Young/Southern Touch Route Variation would alleviate concerns raised by the landowner by eliminating impacts to the property, adoption of the route variation would merely result in the transference of impact to another landowner. Additionally, the route variation would result in an increase in construction-related land requirements and associated temporary impacts, while increasing the total pipeline length. For these reasons, we do not consider the Young/Southern Touch Route Variation to be environmentally preferable to the proposed Project route, and we do not recommend it.

4.4.3 Garner Route Variation

The Garner Route Variation was suggested by the owners of a tract of land that was previously affected by the establishment of an electric transmission line right-of-way, which the proposed Project route would parallel in the vicinity of the property in question. The landowners suggested that Project effects to their property be avoided by shifting the proposed pipeline route to the north side of the electric transmission line right-of-way.

The Garner Route Variation would deviate from the proposed Project at MP 101.6, just west of the Garner property in Jackson Parish, Louisiana, and cross to the north side of the approximately 100-foot-wide transmission line right-of-way. The route variation follow the right-of-way eastward to approximately MP 101.9, where it would rejoin the proposed Project route on the southern side of the existing right-of-way (see Figure 4.4.3-1). Both the proposed Project route and the Garner Route Variation would traverse forested uplands/pine plantation that borders the existing right-of-way. As the route variation would be approximately the same length as the proposed Project route, construction land requirements and associated environmental effects would be also be similar. Neither would require the crossing of wetlands or waterbodies.

Although it appears that the Garner Route Variation would alleviate concerns raised by the affected landowner, adoption of the route variation merely result in the transference of impact to another landowner on the north side of the existing electric transmission line right-of-way. Additionally, adoption of the route variation would offer no environmental advantages while resulting in two additional crossings of a high-voltage electric transmission line that would introduce constructability and worker safety concerns. For these reasons, we do not recommend the Garner Route Variation.

4.4.4 Sartor Variation

During the scoping period for the proposed Project, we received a comment that the proposed Project route would adversely affect an existing FWS conservation easement located near MP 146.1, just east of the

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Figure 4.4.2-1-A
Young/Southern Touch Route Variation

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Figure 4.4.2-1-B
Young/Southern Touch Route Variation

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Figure 4.4.3-1
Garner Route Variation

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Boeuf River in Richland Parish, Louisiana. The Sartor Route Variation was developed to avoid or minimize impacts to that conservation easement, which is discussed in more detail in Section 3.8.5. The Sartor Route Variation would deviate from the proposed Project route at MP 145.8, near an HDD exit point just east of the Boeuf River and then proceed northeast and east, circumventing the FWS easement (see Figure 4.4.4-1). The route variation would continue eastward to approximately MP 147.2 where it would rejoin the proposed Project route.

The route variation would be about 0.1 mile longer than the proposed Project route, increasing the construction right-of-way requirements by about 1.2 acres. Based on site visits by the FERC staff, both the proposed Project route and the Sartor Route Variation would primarily traverse areas of active row crop production, as well as scrub-shrub upland habitat within the FWS conservation easement that consist of mechanically planted trees surrounding a drainage ditch. Neither would require the crossing of wetlands or waterbodies, other than agricultural drainage ditches.

In it's comments on the NOI, FWS indicated that CEGT should consult with the FWS North Louisiana National Wildlife Refuge Complex to obtain a Compatible-Use Determination and ascertain the need for any Special Use Permit in association with the proposed crossing of the FWS conservation easement. However, FWS did not indicate any significant objection or concern with the proposed crossing of the easement. The Sartor Route Variation would not eliminate impacts to the FWS conservation easement, but it would shift the pipeline route toward the northern end of the easement and agricultural field, which may be desirable to the FWS or the affected landowner. We do not consider that the Sartor Route Variation would offer any significant environmental advantage to the proposed Project route, and we therefore do not recommend it. However, in Section 3.8.5 we have included a recommendation for CEGT to consult with FWS to obtain all required authorizations and approvals related to the proposed crossing of the FWS conservation easement and file any FWS recommended measures to avoid and minimize impacts to that easement. Pending the outcome of those consultations, as well as negotiations with the affected landowner, CEGT would propose to adopt the Sartor Route Variation, subject to review and approval by the FERC.

4.4.5 Shelton Route Variation

The Shelton Route Variation was developed in response to a landowner comment expressing concern that the proposed Project route would encroach on his property in Richland Parish, Louisiana. The Shelton Route Variation would minimize impacts to the affected property by generally following property-line boundaries. The route variation would deviate from the proposed Project route at MP 162.1, west of the Shelton property, and proceed eastward before rejoining the proposed Project route at MP 167.4 (see Figure 4.4.5-1).

Relative to the proposed Project, the Shelton Route Variation would increase the total pipeline length by about 0.1 mile and increase the construction right-of-way land requirements by about 1.2 acres. Both the proposed Project route and the Shelton Route Variation would cross a mixture of croplands and forestland. Based on review of available imagery and mapping, it also appears that the proposed Project route and the Shelton Route Variation would cross similar numbers of wetlands and waterbodies (including Big Creek [MP 163.9]). However, the Shelton Route Variation would cross more forested land than the proposed Project route.

Although the Shelton Variation would alleviate concerns raised by the landowner by eliminating impacts to the Shelton property, adoption of the route variation would merely result in the transference of impact to other nearby landowners. Additionally, the route variation would result in an increase in construction-related land requirements and associated temporary impacts to forested uplands, while increasing

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Figure 4.4.4-1
Sartor Route Variation

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Figure 4.4.5-1-A
Shelton Route Variation

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Figure 4.4.5-1-B
Shelton Route Variation

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the total pipeline length. For these reasons, we do not consider the Shelton Route Variation to be environmentally preferable to the proposed Project route, and we do not recommend it.

4.5 ABOVEGROUND FACILITY ALTERNATIVES

We evaluated the proposed locations of the aboveground facilities for the Carthage to Perryville Project to determine whether environmental impacts would be reduced or mitigated by use of alternative facility sites. Our evaluation involved inspection of aerial photographs and maps, as well as site visits along the proposed Project corridor. The aboveground facilities for the proposed Project include two new compressor stations, two meter/regulator stations associated with the proposed pipeline receipt points, and four meter/regulator stations associated with each of the four proposed interconnects with existing interstate pipeline systems (see Section 2.1). Eleven mainline valves and four pig launcher/receiver stations would also be constructed in association with the proposed Project. However, two of the mainline valves and all of the pig launcher/receiver facilities would be located within the confines of the proposed compressor station and/or meter/regulator station sites. Thus we did not consider siting alternatives for those facilities.

Because the location of the meter/regulator stations would be linked to the location of the associated natural gas receipt and interconnect points, the search for alternatives was constrained to sites located adjacent to the intersection of the proposed Project route and the planned and existing pipeline facility locations. Similarly, the locations of mainline valves would also be linked to the location of the proposed Project pipeline. Further, the proposed locations of mainline valves along the proposed Project route were largely determined based on DOT safety regulations that specify the maximum distance between sectionalizing block valves and also require that these facilities be located in readily accessible areas. We did not identify any alternative sites for the proposed meter/regulator or mainline valve facilities that would offer a significant environmental advantage to the proposed sites.

As with the other proposed aboveground facilities, the compressor station locations would be constrained to sites near the proposed pipeline route. Specifically, the proposed compressor station sites along the proposed pipeline route were largely dictated based on engineering and economic design standards. The Panola Compressor Station would be located at MP 8.4 in Panola County, Texas, and the Vernon Compressor Station would be located at MP 101.3 in Jackson Parish, Louisiana. As described in Section 3.8, construction and operation of these facilities would result in a permanent conversion of approximately 6.9 and 6.1 acres of pasture and/or forested land, respectively. However, no wetlands or other environmentally sensitive features would be affected at either of these proposed compressor station locations, and we have determined that operation of these facilities would not result in significant air quality degradation or noise impacts to any nearby residents (see Section 3.11). During the scoping period for the proposed Project, we received a comment requesting consideration of an alternative Panola Compressor Station site, which would be located to the east of the proposed site. We evaluated two alternative sites for the proposed Panola Compressor Station in response to that comment.

4.5.1 Panola Compressor Station Site Alternatives

The first site alternative for the proposed Panola Compressor Station, Panola Site Alternative A (MP 1.9; see Figure 4.5.1-1), would have the advantage of being located in close proximity to existing industrial facilities and infrastructure (e.g., the Duke Energy Field Services natural gas processing plant). These land uses are generally considered compatible with construction and operation of a compressor station. However, our evaluation of aerial photography indicates that Panola Site Alternative A would conflict with existing infrastructure, including buildings, parking areas, and numerous pipeline facilities. CEGT also indicated that this site is unavailable for purchase and would not provide sufficient space for development of the required Project facilities.

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Figure 4.5.1-1-A
Panola Compressor Station Site Alternatives

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Figure 4.5.1-1-B
Panola Compressor Station Site Alternatives

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The second alternative site evaluated for the Panola Compressor Station, Panola Site Alternative B, is located on the eastern side of the Sabine River at MP 6.3 (Figure 4.5.1-1). Because it would be located near the proposed Panola Compressor Station site, this alternative would meet the proposed Project's engineering criteria. Relative to the proposed compressor station site, Panola Site Alternative B would be located a greater distance from any NSAs. However, construction of a compressor station at this location would require clearing of more than 6 acres of densely forested land, and it is likely that land requirements for access road construction at the alternative site would be greater than the proposed site. Further, CEGT asserts that the topography at Panola Site Alternative B would be unsuitable for construction and operation of a compressor station.

As described above, our environmental review did not identify any significant environmental consequences for the proposed Panola Compressor Station site, and we do not consider either of the alternative sites evaluated in our analysis to be environmentally superior to the proposed site. However, both of the alternative Panola Compressor Station sites would be less desirable from an engineering and constructability perspective, and we therefore eliminated them from further consideration.