Exhibit D-8: Guidance for Preparing a Macro-Corridor Study

1 INTRODUCTION

The USDA Rural Utilities Service (referred to as the Agency), requires applicants to submit special preliminary studies when applying for financing assistance for classes of electric generation and/or transmission projects that require preparation of an Environmental Impact Statement (EIS). These preliminary studies are the Alternative Evaluation Study (see Exhibit D-6), the Site Selection Study (see Exhibit D-7) and the Macro-Corridor Study, which is the subject of this exhibit.

The National Environmental Policy Act (NEPA) requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of proposed actions and reasonable alternatives to those actions. The objective of the three preliminary studies is to identify the purpose and need for the action, and identify which alternatives to meeting the purpose and need have been examined by the applicant prior to the Agency's initiation of the NEPA process. The studies provide information to the public and other federal, state, and local governmental agencies to elicit informed comments during the scoping process. Each report need not be of great length, but should include sufficient detail for the Agency, other agencies and the public to independently evaluate the alternatives under consideration in relation to the applicant's stated purpose and need.

This Macro-Corridor Study guidance does not cover the critical first task of transmission system planning –whether a new transmission line is needed; this issue is addressed in the Alternative Evaluation Study guidance (Exhibit D-6). Instead this guidance addresses the processes required to identify a transmission corridor once the need for one has been established. This guidance has been developed to help both the applicant and the applicant's consultant in conducting and documenting the Macro-Corridor Study.

The focus of this guidance is to identify potential corridors within which transmission lines could be sited. However, the concept can be applied to other types of linear projects (e.g., natural gas or water pipelines) for which Agency financial assistance is sought.

1.1 Organization of the Exhibit

The remaining sections of this exhibit are organized as follows:

- Roles and responsibilities
- Development and general approach of a macro-corridor study
- Methodology
- General quality and readability

- Public involvement
- Sample outline for a macro-corridor study
- Three appendices:
    - Appendix 1 - Glossary of Key Terms
    - Appendix 2 - Commercially Available Geographic Information System (GIS) Technologies
    - Appendix 3 - Transmission Line Siting Methodologies

Note that, in addition to the appendices, the Agency is making available a separate stand-alone Environmental Resource Information guide that contains useful information pertaining to the resources considered in macro-corridor siting, including the regulatory authority, responsible agency contact information, reference/web links, and significance of the resource (Environmental Resource Information).

1.2 Purpose of a Macro-Corridor Study

The purpose of a Macro-Corridor Study is to identify areas that appear to be suitable for siting transmission (or other linear) facilities based on regulatory, environmental, engineering, and economic constraints. Such a study is conducted to determine what potential transmission line routing options are available for a particular line, and in general terms, how those options might be planned to avoid potential environmental, social, cultural, and economic effects in order to avoid or minimize problems, impacts, delays, and unnecessary expense in development of the proposed project.

The Alternative Evaluation Study (see Exhibit D-6) identifies the initial problem (e.g., need for new electric transmission), and identifies and evaluates the best solutions for addressing the problem and meeting the need. The Macro-Corridor Study identifies where on the ground the transmission project could be constructed. Specifically, it defines the study area encompassing the end points of a proposed transmission line and develops macro-corridor options for location of the new line between those points. It provides information on environmental, social, and cultural factors for the macro-corridor options within the study area.

1.3 Role in Environmental Review Process

The Alternative Evaluation, Site Selection and/or Macro-Corridor Studies are the earliest environmental documents submitted to the Agency and serve as the foundation upon which the Agency will conduct its NEPA analysis. The information contained in these preliminary studies will be used throughout the environmental review process for the project.

Ideally, the Alternative Evaluation Study should be completed first and provided to the Agency for analysis of the purpose and need for the action and whether the range of technological

alternatives is appropriate. The preliminary documents are made available to affected federal, state, and local agencies and the interested public during scoping. Scoping is the early and open process for determining the scope of issues, including impacts, issues and alternatives that will be addressed in a NEPA document. See also RUS Bulletin 1794A-603 (*Bulletin on Scoping Guide for Agency-funded projects*) for more information on scoping activities.

The purpose of the preliminary studies is to provide information to the other agencies/public to facilitate their participation in determining the scope of the environmental review and to comment on the feasibility of the applicant's proposed plans. The studies must be reviewed and accepted by the Agency prior to the commencement of scoping. Information contained in the Macro-Corridor Study should be adequate to allow the Agency and other participating agencies and the public to independently evaluate the proposed transmission corridor options.

Other Federal Agencies

Due to involvement of federal lands and/or permits required from other federal agencies, one or more federal agencies may participate in the Agency's environmental review/NEPA process. The agencies will determine cooperating and lead agency status thereby clarifying the requirements of the preliminary studies and NEPA process.

In addition, electric transmission facilities proposed to be located in the National Interest Electric Transmission Corridors (National Corridors) are potentially subject to the Federal Energy Regulatory Commission electric transmission facilities permit process (www.ferc.gov).

Additional State Review Requirements

The Macro-Corridor Study may also be used to support state permitting and environmental reviews. Many states have transmission siting statutes and regulations.

State public utility commissions (PUC) and other authorities which regulate the issuance of transmission siting permits may have developed their own siting processes to ensure that a need for the line exists and that the transmission route selected has a minimal effect on the state's environmental, cultural, and socioeconomic resources. Many states require that alternatives to the applicant's preferred or proposed route be considered. Some have specific instructions that a utility must follow. If there is an environmental review process or project approval process in the state where the project would be constructed, the Agency will make an effort to work with the appropriate state agency(ies) to minimize duplication of effort.

2 ROLES AND RESPONSIBILITIES

2.1 Agency NEPA Support Staff

The Agency will assist the applicant by outlining the types of information and analyses required, independently evaluating the information submitted, and making environmental documents available to the other agencies and the public for review and comment in a timely manner.

2.2 Applicants

An applicant requesting Agency financial assistance is responsible for identifying its purpose and need for the proposal and developing reasonable alternatives that meet its purpose and need. The applicant is responsible for conducting the Macro-Corridor Study to assist the Agency throughout the environmental review and decision-making process and for documenting the study results in accordance with the format and standards provided by the Agency in this guidance document.

Prior to undertaking the Macro-Corridor Study, the applicant should contact the RUS Power Supply Division (PSD). PSD will likely require the applicant to provide a presentation of the project purpose and need in order to receive the approval to proceed with the environmental review process and additional engineering requirements. The Engineering and Environmental Staff (EES) should also be contacted to determine the category of environmental review (in accordance with 7 CFR Part 1794) and Agency environmental requirements. A meeting between the applicant and Agency staff has been shown to be an effective way to exchange information; Agency staff will identify the appropriate engineering and environmental procedures that must be followed and the submittals required by the Agency. If the applicant intends to use a consultant to conduct the Macro-Corridor Study, the consultant should be included in these initial meetings.

2.3 Contractors/Consultants

An applicant may employ an environmental professional or technical service provider (e.g., contractor) to assist in preparation of its environmental review documents, including the Macro-Corridor Study. For example, given the importance of using Geographic Information System (GIS) technology in macro-corridor siting, an outside consultant trained in GIS may be necessary, depending on the extent of the applicant's in-house capabilities. See also discussion in Section 3.3 on the use of GIS in macro-corridor studies.

2.4 Public & Other Agencies

Other federal, state, and local agencies, as well as the public, will have the opportunity to review and provide comments on the Macro-Corridor Study during the NEPA scoping process; however, their input is also important during the early phases of the siting process, such as to support information–gathering and to identify siting opportunities and constraints (see Section 4.5). Various public participation tools and techniques are available to provide information to the stakeholders (e.g., landowners and members of the public with an interest in the project) and receive input on corridor development at each step in the process. These tools include but are not limited to: websites (project description, stakeholder notification, news releases), voluntary public meetings and corridor workshops or open houses, as well as required public meetings/hearings. **Public involvement, whether part of the formal scoping process or prior, must be captured and documented in the Macro Corridor Study.**

3 DEVELOPMENT AND GENERAL APPROACH OF THE MACRO-CORRIDOR STUDY

3.1 Terminology

Key terms used in transmission line siting are defined below.[1]. See also Appendix 1 for a complete glossary of terms.

- Study Area: A geographic area to be assessed for siting the proposed action, within which the macro-corridor is sited; may be a group of states, a group of counties within a state, or adjacent states, etc. The size of the study area should be sufficient to allow evaluation of areas with differing environmental, engineering, and regulatory constraints. The study area should be small enough to encompass only feasible alternatives (engineering and cost considerations to meet the purpose and need), but large enough to include an adequate number of alternative corridors. The boundaries allow for the development of all feasible corridors, provide the area necessary to account for potential impacts, and focus the study efforts to an area compatible with that used for the overall environmental analysis.

- Macro-Corridor: broad linear area of land within which the alternative corridors can be located for further study and comparison. This area encompasses the end points of a

[1] Definitions were derived from a combination of those provided in the Electric Power Research Institute (EPRI) and Georgia Transmission Corporation (GTC) technical report, *Overhead Electric Transmission Line Siting Methodology* (2006) and those developed by the Agency's staff for purposes of this Exhibit (see also Appendix 1).

proposed transmission corridor and is located within the larger study area. The macro-corridor may consist of one contiguous broad area within which many alternative corridors could be located, or more than one broad linear area each providing an alternative corridor possibility.

- Alternative Corridors: linear areas within a macro-corridor that are deemed suitable for placement of the transmission line when the natural environment, built (manmade environment), and engineering requirements are considered. The width of the corridor must be large enough to allow latitude in specifically locating the transmission line but not so broad as to be meaningless.
- Route: a constructible right-of-way (ROW) within an alternative corridor.
- Siting: The interdisciplinary process of determining the location for a proposed action. Siting is a continual process of refinement from study area to macro-corridor to corridor to route.

The relationship of these terms is illustrated in Figure D-8-1 which shows the sequence of steps to be followed in siting a transmission line, beginning with identification of the study area and ending with selection of a route.

Note that the Macro-Corridor Study typically ends with identification of one or more macro-corridors, thereby signaling the beginning of scoping and the NEPA process. The final step, selection of the preferred corridor or route as identified by the Agency or applicant/utility/project proponent, would not be determined at the macro-corridor level but rather as part of the NEPA process. Regarding the intermediate steps - including the identification of alternative corridors and routes - their inclusion in the Macro-Corridor Study is project-dependent (e.g., may be appropriate for smaller-scale projects), and would be determined through consultation with the Agency. In general, however, these steps would also be deferred to the NEPA process.

3.2 General Approach

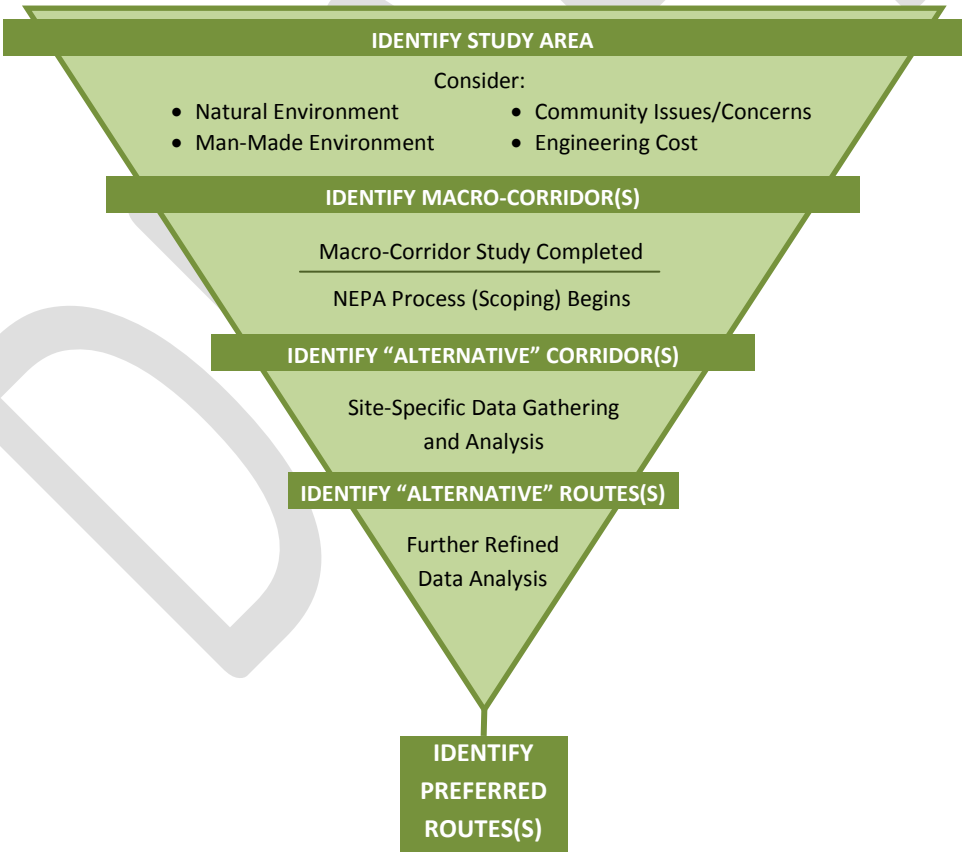
The Macro-Corridor Study is a report of the preliminary transmission line siting process, prepared by an interdisciplinary team representing engineering, environmental, land acquisition and other disciplines.

The transmission line siting process should be accomplished in phases to systematically narrow the number of alternatives. In the initial analysis, resource data are analyzed to identify suitable areas (opportunities) for siting and unsuitable areas (constraints) to be excluded or avoided. In

further phases of the siting process, tighter environmental and engineering constraints can be applied to further narrow potential transmission corridors and corridor options as appropriate.

The study should clearly identify and describe the opportunities and constraints developed for the proposal. It is important that the Macro-Corridor Study be well documented, including the reasons for excluding or avoiding certain areas. If there is no practicable alternative to siting in a potentially unacceptable area (e.g., sensitive area), this must be particularly well documented. Note that routing through a sensitive area will also likely result in the need to conduct additional studies and prepare additional documentation for the agency with authority over the sensitive resource.

Figure D-8-1



The Macro-Corridor Study primarily utilizes (1) existing data - either publicly available on the Internet or readily available from the resource agencies - and (2) interaction with agencies, independent experts, and stakeholders to:

- identify areas where major environmental, engineering and/or regulatory/legal conflicts could exist; and
- narrow the realm of potential corridors in an efficient and effective manner.

Coordination with federal, state, and local agencies and other key stakeholders should begin in the early phases to make them aware of the proposal, obtain their input, and determine the necessary permits that must be obtained along with other regulatory requirements. The applicant should also notify stakeholders of its intent to apply for Agency financing and refer them to the Agency for information regarding its NEPA process.

3.3 Use of GIS in Macro-Corridor Siting

GIS has become a valuable decision-making tool in situations when data relevant to a decision include a spatial component. GIS software provides tools to manage, visualize, and analyze geographic data including: physiographic setting, sensitive environmental and cultural resources, land ownership, land use designations, and existing infrastructure. Layers of different information, such as land ownership, protected environmental resources, and existing infrastructure, are superimposed on a map/aerial or satellite image, and information can be easily accessed and queried.

The Agency requires applicants to use GIS software in macro-corridor development (exceptions may be granted by EES on a case-by-case basis). GIS models enable the use of map overlays, spreadsheets, reports, and graphic illustrations to make more informed, objective, and defensible decisions. Appendix 2 provides more information on commercially available GIS technologies.

3.4 Level of Detail (Sliding Scale Approach))

Because each applicant proposal represents a unique set of circumstances and impacts, the preparation of a Macro-Corridor Study does not reduce to a single formula. While this guidance is generally targeted toward the level of detail that might be needed to support preparation of an electric transmission line EIS, it should be adapted to the particular circumstances presented by each proposal. A sliding-scale approach should be utilized when determining how many alternatives to identify and analyze, and the depth of analysis to provide for each alternative. For example, proposals where there is a greater potential for significant environmental impacts from the proposed action, may need to identify and analyze at a higher level than proposals

with smaller impacts. The Agency's environmental staff should be contacted to receive guidance as to whether or an applicant's proposal may meet this threshold.

4 METHODOLOGY

The basic steps in conducting a Macro-Corridor Study are discussed below (see also Figure D-8-1).

An initial meeting with the Agency's staff is required to classify the proposal in accordance with 7 CFR 1794, identify the necessary technical requirements, and develop an appropriate scope.

Next steps include definition of the study area, resource data collection, and macro-corridor generation based on the identification and analysis of areas of opportunity and constraints within the study area.

As noted previously, the Macro-Corridor Study documents the siting process through the identification of macro-corridors. Macro-corridors within a study area serve as a useful guide for planning the general corridor within which the proposed transmission line might be constructed. The identification of corridors and routes, including the preferred route, is deferred to the NEPA process following public scoping. In particular, the preferred corridor or route, as identified by the agency or applicant/utility/project proponent, is not determined at the macro-corridor level.

4.1 Technical Requirements

At the outset of the transmission siting process, the applicant and other project participants should meet with the Agency and identify the necessary technical requirements of the proposal, including but not limited to: (1) the voltage, structure type, dimensions, ROW requirement and potential start and end points for transmission lines; (2) requirements for associated facilities; (3) special conditions or concerns associated with the project; (4) appropriate scope of study based on project scale; (5) use of GIS and appropriate software; and (6) approximate schedule for corridor development.

4.2 Definition of Study Area

Upon determination that a transmission line is needed (i.e., outcome of the Alternatives Evaluation Study), the first step is to identify and characterize the study area. A study area may be a group of states, a state, a group of counties within a state or adjacent states, or any other geographic area. The size of the study area should be sufficient to allow evaluation of areas

with differing environmental, engineering and regulatory constraints. The study area should be small enough to encompass only feasible alternatives (i.e., based on engineering and cost considerations that meet the purpose and need), but large enough to include an adequate number of transmission macro-corridors. For example, if the Alternatives Evaluation identifies a 230 kV line needed to connect two towns 75 miles apart, the study area would not include another state 200 miles away.

The study area location should be identified in terms of political boundaries (e.g., counties) and geographic size (area and perimeter). General physical characteristics of the study area should also be described as well as other special considerations (e.g., those not necessarily found in a GIS database).

Satellite imagery and other publicly available data (including GIS) provide a good overview of the general land uses, land cover, and environmental conditions in the study area.

4.3 Resource Data Collection

The next phase of the macro-corridor siting process is data collection to support the opportunities and constraints analysis (see Sections 4.4 and 4.5). Resource data needs include study area resources likely to be affected by transmission line construction, maintenance, and operation. Data for resources within the study area should be readily available from environmental management agencies within federal, state, and local governments. Data should be in a format to support preparation of GIS resource maps for the various resource categories evaluated. See Appendix 2 for GIS resources relating to environmental resource and land use data. In addition, a separate reference guide (Environmental Resource Information) is available that contains useful information for the relevant environmental resources, including responsible agency contact information and reference/web links. The source(s) of the resource data collected should be referenced in the Macro-Corridor Study.

Physical features that should be briefly described include, but are not necessarily limited to:

- Physiography (topography/terrain)
- Geology
- Land use/land cover (including public and other dedicated lands, agriculture, mining, forest, undeveloped, urban)
- Sensitive areas/wildlife resources (e.g., National Forests, National Wildlife Refuges, archaeological and historic districts)
- Wetlands
- Cultural resources

- Hydrology (open water, streams, floodplains)
- Transportation corridors (major highways, rail, airports)
- Socioeconomic characteristics
- Recreation resources
- Existing transmission lines
- Other utility corridors

4.4 Identification of Opportunities and Constraints

In the next step in macro-corridor development, resource data are analyzed to identify opportunities for siting and constraints (areas to be excluded or avoided.). The study should clearly identify and describe the opportunities and constraints identified for the proposal.

4.4.1 Siting Opportunities

Areas of opportunity are those within which transmission line construction would be more compatible with the current land use, have a reduced likelihood of additional impacts, and result in more efficient line operation and management. Potential opportunities include but are not limited to:

- Existing transmission line/utility corridors (for expansion, parallel potential)
- Transportation rights-of-way
- Industrial areas
- National Corridors
- Property boundaries

The development of a macro-corridor should identify existing linear transportation (e.g., highway, rail) and utility corridors, including existing transmission lines and pipelines within the study area. Existing rights-of-way should be examined for possible use in (1) locating a corridor, (2) potentially expanding an existing corridor, and (3) rebuilding/double-circuiting opportunities. Consideration of existing rights-of-way can expedite the siting process. Where possible and allowable, corridor locations should be adjusted to align with existing rights-of-way. By collocating new corridors with existing infrastructure, undeveloped locations may be avoided or minimized, thereby reducing the potential level of project-related impacts to undisturbed (greenfield) natural and cultural resources.

4.4.2 Siting Constraints

Constraints must be identified in order to determine the desirability and feasibility of siting throughout the study area. Siting constraints relate to the physical and environmental characteristics of the area itself (e.g., topography, conflicting land uses), as well as statutory, institutional, engineering, and economic constraints, that would serve as impediments to corridor designation. The Macro-Corridor Study must include the rationale used to determine which siting constraints are considered and applied in the study.

Note that primary constraints are identified first and then more restrictive constraints, which require increasing levels of detail, can be applied in later phases to systematically narrow the study area and macro-corridors. Therefore, at the preliminary level of review, not all resources need to be identified to the extent required for final corridor selection. Additional agency and stakeholder input, field surveys, and analysis will be conducted as part of the federal and state environmental review processes, and be used as part of the decision to select the preferred transmission line route. The sensitivity of constraints varies by proposal and, in some instances, one or more of these factors may be easily dismissed as a constraint to siting.

<u>Environmental Constraints</u>

Primary environmental constraints include but are not limited to the factors identified below. These factors are divided into two general sets:

(1) those designated as "exclusionary" that would make siting in that area virtually impossible; "exclusionary areas" refer to areas that may not be crossed unless authorized by the appropriate official (for example, governor, agency head, etc.), where exclusion is based on law/regulation/impact and not on cost, regional or local pressure, or desirability;
(2) those designated as undesirable (due to conflicts with existing land use, development, or resources) and should be avoided when other reasonable alternatives exist; such areas may be referred to as avoidance areas or risk resources and are considered to have low suitability.

The impact of a particular constraint varies with each proposal, each siting area, the practicability of implementing mitigation, etc. While comprehensive, the constraints listed below should not be considered exhaustive; modifications or additions should be made when necessary. Depending on the project and study area, certain sensitive areas (e.g., known occurrences of threatened and endangered species or their critical habitat, etc.) may be considered an avoidance area constraint or an exclusionary area.

Exclusionary Areas

- Areas that may not be crossed by corridors unless authorized by the appropriate official; examples may include National Parks or Monuments and Congressionally-designated Wilderness Areas.
- Areas protected by legislation, regulation, administrative policy; physical constraints to transmission line construction and operation; or potential for significant impact (where reasonable mitigation is not possible).

Note that exclusion is not based on cost, regional or local pressure, or desirability.

Constraints

- Important farmland, rangeland, and forestland
- Critical habitat (or known location/nest of threatened and endangered species)
- Wetlands
- Floodplains
- National Wildlife Refuges
- Conservation easements
- Wild and Scenic Rivers
- Vistas
- Cultural sites/known cultural resources (listed on or eligible for National Register of Historic Places)
- Historic/archaeological districts
- State parks/recreation areas
- Other state and local restrictions
- National trails
- Tribal lands

A separate environmental resource information guide (Environmental Resource Information) is available to support the identification and evaluation of constraints. It contains useful environmental resource information pertaining to these constraints, including the regulatory authority, responsible agency contact information, reference/web link, significance of the resource, and why it is considered a constraint.

Built Environment Constraints

The location of developed areas, including buildings and their uses, must be considered in transmission line siting. Federal, state, local, and National Electrical Safety Council (NESC) building setback requirements should be evaluated during the identification of potential alternative corridors.

Constraints

- Areas surrounding federally regulated facilities, e.g., Department of Defense, Federal Communications Commission, Federal Aviation Administration, and National Aeronautics and Space Administration
- Airports
- Mining and mineral resources
- Sensitive receptor facilities such as residential areas, schools, hospitals, and community facilities; consider building density and planned developments.

Engineering and Economic Constraints

Engineering and economic factors also need to be considered when selecting a corridor. Such factors vary with each project and may include, but are not limited to:

- Topography (e.g. prevalence of steep slopes which present construction, erosion, and maintenance problems);
- Transmission structure design, overall length, span limitations, number of angle structures;
- Number of high voltage lines/railroad/highway crossings;
- Number of river, railroad and highway crossings;
- Non-spannable water crossings;
- Scenic highways;
- Gas pipelines;
- Presence of wetlands/marshes and floodplains;
- Need for access roads;
- Right-of-way limitations; and
- Presence of existing infrastructure (including other utilities) or other development.

Socioeconomic Constraints

Socioeconomic issues should also be included in siting considerations through preliminary evaluation of such factors as the available labor force, presence of subsistence based economies, and potential project impact on community facilities and services. Local sites that have special value to area residents (e.g., recreational areas) should also be considered in siting. Note that any assessment of socioeconomic issues would include only a cursory, high level review based on existing, publicly available information; no site-specific information would be required.

Environmental Justice Constraints

Another element that needs to be considered in siting is potential project impacts on minority or low-income populations (environmental justice). Environmental justice considers whether minority or low-income communities could experience disproportionately high and adverse environmental or health impacts in comparison to other communities. In comparing macro-corridors, this principle is evaluated on the basis of whether impacts to minority or low-income communities are significantly different when comparing one corridor to another. Similar to socioeconomic issues, any assessment of environmental justice concerns would involve only a cursory, high level review using existing information and no site-specific data collection would be necessary.

Future Actions and Potential Cumulative Impacts

Future actions in the study area, including but not limited to planned utility and road construction projects and residential development, should also be considered in the siting process, depending on the location and timing of such actions. Consideration of such projects could result not only in the identification of additional opportunities or constraints not otherwise considered, but also in the potential for cumulative impacts within a particular corridor that should be evaluated and compared against the impacts of other corridors. Cumulative impacts are impacts on the environment that result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes the action.

4.5 Opportunities/Constraints Analysis and Identification of Macro-Corridors

The macro-corridor selection process is accomplished in phases to systematically narrow the range of alternatives. In the first analysis, the applicant should identify opportunity and constraint criteria based on resources and study area characteristics that provide favorable or unfavorable attributes for locating the transmission line. In some cases, suitability values may be assigned to the criteria to help evaluate and compare the suitability of one corridor with another (see Section 4.6 for a discussion of suitability values). The opportunities and constraints should be mapped within the study area. During the opportunity and constraint mapping process, appropriate federal, state, and local agencies and other key stakeholders should be contacted to inform them of the proposal, siting process, and solicit input on the constraint map.

Based upon project requirements and the results of the initial opportunity and constraints analysis, least-risk macro-corridor locations can be developed to target areas of opportunity (suitable areas) and avoid areas of constraint. They are referred to as least-risk because they identify the path(s) of greatest opportunity and least constraint within a macro-corridor and connect the proposed action's end points. These least-risk macro-corridors would define the area where more detailed data collection may occur, and where more detailed opportunity and constraints may be applied, to further narrow transmission corridor alternatives in later stages of the siting process as appropriate.

GIS is required[2] for use in the opportunity and constraints analysis and to assist in the identification of macro-corridors for further consideration; the opportunity and constraints analysis is, in essence, the application of a GIS-based analytical model. Use of existing digital data layers allow for quick identification of the most suitable locations for transmission lines in the project area. The industry has developed computer-based models (e.g., using GIS) that systematically identify transmission routes that have the least impact on surrounding landscapes and result in more logical and defensible decisions. GIS software such as ArcGIS uses least-risk path analysis algorithms included in the software to generate a composite suitability map, model paths within the macro-corridor, and identify general proposed paths of opportunity for alternative transmission corridors. See Appendix 3 for a description of these types of systems.

Applicants may develop their own GIS model (e.g., derived from land cover/land use classification of satellite imagery) or use a commercially (off-the-shelf) available model; see Appendix 2 for information on commercially available GIS technologies. Spatial data can be

[2] Exceptions may be granted by EES on a case-by-case basis.

categorized for each resource, and a GIS model can be applied to map the areas of opportunity and constraint (suitability layers) into a suitability map. The suitability map associates geo-referenced features, land cover types, or land uses with the likelihood of potential impacts from the proposed transmission line. Possible GIS siting model scenarios may include: (1) upgrading or paralleling existing transmission lines, (2) paralleling existing roads or other linear features, (3) crossing undeveloped land (cross country), and (4) a combination of the other three scenarios.

The Macro-Corridor Study should clearly identify and describe the opportunity and constraint criteria developed for the proposal, as well as any suitability values assigned to the criteria. The study should display the results along with a description of any adjustments or modifications made to account for study-area specific factors. In identifying the macro-corridors, note that corridor widths may vary from project to project, based largely on the scale of the proposed project, topography, and land use characteristics of the initial study area. In general, macro-corridors are narrower than the original study area but still sufficiently wide to allow further corridor refinement in later stages as needed - allowing the applicant some flexibility in final routing after the macro-corridor study is completed. In reality, the width of a macro-corridor may be several miles wide for some projects and appropriately be limited to the width of the ROW for others (based on constraints). In some cases, a state may have pre-determined a corridor width; to use this width in the federal NEPA analysis, concurrence must be sought from the Agency (and substantiated).

4.6 Assigning of Suitability Values

To ensure that macro-corridors are located in the most suitable areas, applicants may choose to develop suitability values to help evaluate and compare the suitability of one corridor over another. While not a requirement, this step - if implemented - would be part of the macro-corridor identification process as described in Section 4.5.

To evaluate the suitability of each corridor resulting from the opportunity and constraints analysis, each criterion is evaluated independently. Both qualitative and quantitative evaluation methods are acceptable as long as the methods for defining terms are clearly and transparently described; for some projects, both methods may be appropriate for select criteria. The fundamental goal under either method is the same - to find a viable corridor or route from one point to another that identifies preferred areas (opportunities) to site the line while minimizing, to the maximum practicable extent, the negative effects on natural resources, cultural resources, residences, and other sensitive features (constraints).

Using a quantitative approach, the features of each resource identified are rated with a numeric suitability value that characterizes the level of constraint or opportunity that is appropriate for the resource in relation to locating the transmission route. The rating system (numerical scale), for example, can include positive and negative numbers (with positive numbers characterizing a resource risk, and negative numbers indicating an opportunity for siting). The rating system is typically designed to protect the most sensitive parts of the study area by identifying areas of with the greatest potential for negative impacts, while highlighting areas best suited for construction of the line. Use of a rating (or suitability) scale provides a way of expressing preferences for one corridor over another.

In a qualitative approach, a rating system might rely on general designations of “high”, “medium” and “low” (or zero if no risk or opportunity), or a color scheme (red, yellow, green) to provide a graded measure of risk and opportunity associated with each resource; or the more complex criteria might even require some narrative discussion. In all instances, the classifications would have to be clearly justified and explained.

A matrix approach is a useful way to present, document and compare suitability values of one corridor against another.

In summary, while an applicant may have flexibility in determining which process and scale to use to assign values (especially dependent on the type of GIS model used), all activities, and the values assigned, must be clearly described and documented in the Macro-Corridor Study.

4.7 Assigning of Weights

The assignment of weights is not a requirement of the Macro-Corridor Study, and, in fact, weights are rarely assigned and used in macro-corridor studies. If weighting is used, however, **the Agency requires stakeholder input.** The weighting process and an explanation of the weights assigned must be clearly described and documented in the Macro-Corridor Study. Applicants choosing to assign weights should consult the Agency on how to proceed, however the following guidelines are provided.

The weighting process assigns a relative importance to each suitability value (resource) in an effort to evaluate tradeoffs among suitability criteria. This relative importance should be reflected as a numerical weight value. The assignment of weights is a sensitive issue in siting because the opinions and value judgments as to the relative importance of individual criteria vary with the perspectives of the individual stakeholder or group. There are a number of

techniques for assigning importance weights to criteria; and there are also a variety of methods for developing criterion weight values.

The Delphi Method is a traditional method developed to obtain the most reliable consensus among a group of experts by a series of questionnaires interspersed with controlled feedback; the process offers a structured method of consultation that may reduce bias and allow groups of individuals as a whole to resolve a complex problem.

A second method is a decision-making process called the Analytic Hierarchy Process designed to help groups set priorities and make the best decision possible when both qualitative and quantitative aspects of a problem need to be considered. It reduces complex issues to a series of pair-wise comparisons and then synthesizes the results. This approach helps decision-makers arrive at the best solution while also providing a clear rationale for the decision reached.

The requirement for stakeholder involvement necessitates that the applicant conduct meetings to share important information, identify special concerns and siting constraints, and participation in assigning weights to criteria used to evaluate and compare alternative corridors. Stakeholders and weights are regionally specific and must be identified in the region of the macro-corridor siting. The weighting process should be determined by a multi-disciplinary committee including industry representatives, subject matter experts (environmental and engineering), interested members of the public, and other key stakeholders.

See Section 6.2 for additional discussion on stakeholder involvement in the weighting process.

4.8 Macro-Corridor/Corridor Refinement

After the macro-corridors are identified, the applicant and Agency may apply more stringent criteria to narrow the macro-corridors down to alternative corridors and ultimately to a few recommended corridors or routes (least-risk corridors). More detailed analysis of constraints and the mitigation potential of possible adverse impacts can reduce the number of reasonable corridors. This requires the collection of more detailed (location-specific) data throughout the process; however, deferring this level of data collection until a smaller area and/or number of alternative corridors are identified significantly reduces data acquisition efforts and costs.

NEPA does not require a certain number of alternatives (corridors) to be evaluated, but rather an examination of “all reasonable alternatives,” including the preferred alternative and the no action alternative. In general, the greater the number and extent of impacts, the greater the

number of alternatives that may need to be analyzed (see discussion of sliding scale in Section 3.4). It is important that the applicant identify the factors considered in reducing the list of alternatives to the proposed corridors. A clear, detailed presentation is essential in evaluating the reasonableness of the recommended corridors. Evidence of sufficient data gathering in obtaining comparative information on the alternatives is also a primary concern.

Macro-corridor and corridor refinement uses much of the same information as used in the development of macro-corridors, but relies on more detailed, site-specific information. The opportunity and constraint criteria used to identify preliminary macro-corridors would be expanded upon as needed, with each route being analyzed on a segment-by-segment basis using routing criteria developed through public/agency consultation process and from stakeholder input (e.g., engagement with landowners, agencies, and tribes to obtain input and identify preferences). Next steps include the evaluation and ranking of impacts, where ranking reflects the relative impact a given route alternative has on resources compared to the impacts of other alternatives. Note that suitability values may be assigned during the refinement stages as well (see Section 4.8). Scores would be tallied to provide a relative indication of overall suitability of alternatives with respect to one another, and compared to ultimately identify a set of specific alternative routes (within each of the alternative corridors), possibly including the preferred route (if known), although sometimes the preferred alternative is not identified until the NEPA process is nearly complete.

Continued alternative corridor and route refinement typically extends into the NEPA process, where the final set of alternative routes would be analyzed in greater detail in the Agency NEPA document. As such, the desired outcome of the Macro-Corridor Study would be the identification of a limited set of corridors, including macro-corridors, which could become corridor alternative possibilities for consideration in the Agency NEPA document.

4.9 Field Reconnaissance and Surveys

In general, the purpose of field reconnaissance (overflights, windshield surveys, site visits, and field surveys) is to verify findings of the suitability mapping or literature reviews (i.e., confirm desktop evaluation), collect additional data, update the current land use of a specific corridor (to identify presence of any new features not identified in available resource databases), and identify any other previously unknown features or constraints that may affect site suitability, including visual impacts/aesthetics.

Reconnaissance can occur early in the process to help provide an overview of the general land uses, land cover, and environmental conditions in the preliminary macro-corridor(s), especially

if satellite imagery of an area is limited. More often field reconnaissance data are collected in the final phases of macro-corridor identification or later during preferred corridor selection to support segment generation, resource quantification, route delineation, and route refinement. Gathering more detailed, location-specific data helps provide a more accurate characterization of a particular corridor and support a quantitative evaluation and comparison of alternative corridors. Collection methods include field visits, engineering surveys, property ownership information, and consultant data services such as onsite soil borings, archaeological reviews and ecological surveys. More detailed on-site survey work would likely be limited to the final set of alternative corridors carried forward to the NEPA document, and conducted as part of the NEPA process. In some instances, detailed on-site surveys may be limited to only the preferred alternative.

A description of field reconnaissance activities conducted in support of the Macro-Corridor Study should be documented in the study, along with the results.

4.10 Legal and Permitting Issues

Utilities will be required to obtain approvals from a variety of federal and state agencies prior to constructing the proposed project. During development of the Macro-Corridor Study, permitting and regulatory requirements should be reviewed to identify jurisdictional authority at the federal and state level. A preliminary list of regulatory requirements, including agencies with permitting or approval authority and the necessary permits/approvals should be included in the study.

5. GENERAL QUALITY AND READABILITY

A quality, readable document enhances the entire siting process and the subsequent NEPA process it supports. Decision-makers can better understand the identification, evaluation, and comparison of alternatives when the siting process and resulting analysis is presented with clear, accurate, and complete information.

Documents should be written to inform the public; written precisely and concisely in plain language. Sufficient rationale should be provided to support conclusions and technical terms that may be unfamiliar to the public/stakeholders should be defined. The terms defined in the glossary associated with this document must be used throughout the Macro-Corridor Study.

Graphics and Data Treatment

Information, particularly when comparing macro-corridors, should be presented in comparative form to help define the issues and provide a clear basis for decision-making. Use of easy-to-follow tables and figures/maps/graphics, where appropriate, will help summarize data, show comparisons and correlations, enhance understanding, and facilitate the reader's access to the information. Technical terms should be clearly defined. The study must contain enough information to allow Agency staff, decision-makers, and the public to evaluate the differences among alternatives. Additional suggestions include:

- Highlight key data and findings;

- Include a tabular display of alternative macro corridor characteristics. The table should concisely summarize the alternatives by delineating their key characteristics. Specifically,

    - The study should contain at least one comparative table which illustrates the rating of each alternative macro corridor in accordance with the suitability criteria. Depending on the complexity of the table, it may be necessary to present environmental concerns and engineering/economic concerns in separate tables. Presenting alternatives in the same order in all tables allows easy comparison of corridors.
    - If the screening process consists of a series of evaluations to narrow the set of reasonable alternatives, a progression of tables can be very helpful in summarizing the evaluation process.

    - Note that information presented in tabular format does have certain limitations with respect to accuracy and completeness. Subtle differences can be notated on the tables and explained in detail in the text.

- Use maps, drawings, aerial imagery, and photography to depict all features that are needed to understand the project's siting options and impacts. Use of visual imagery (e.g., GIS mapping results, satellite and aerial imagery) is particularly effective in a Macro-Corridor Study to show steps in the process and the outcome.

- Present alternatives objectively. An objective presentation of alternatives advances the credibility of the applicant and the proposal.

Example Table D-8-1 shows one possible format for presenting information on alternative transmission macro-corridors. This example table is not all inclusive, and certain factors may be irrelevant for a particular project, while other projects may require consideration of other concerns. Applicants should ensure that the factors compared reflect the environmental and engineering considerations that are likely to be significant. The criteria to be included in the table will vary with each project, and additions and deletions may be required to accurately portray potential effects. Refer to Section 4.4.2 for other potential constraints to include. Whenever possible, meaningful, constraints should be quantified by defining the criteria in terms of the number of resources affected (e.g., number of residences within the corridor, number of stream crossings) or in terms of the length or area of land involved (e.g., miles of prime farmland crossed).

Table D-8-1
Macro-Corridor Comparison

Issue	North Macrocorridor Option 1	Central Macrocorridor Option 2	Macrocorridor Option 3 (non-federal lands)
Macrocorridor Length	100 miles	60 miles	150 miles
Existing Linear Infrastructure	80 miles transmission lines 5 miles pipelines 0 miles railroad 15.0 miles roads	30 miles transmission lines 25 miles pipelines 5 miles railroad 0 miles roads	75 miles transmission lines 0 miles pipelines 0 miles railroad 50 miles roads
New Corridor Required (no existing linear Infrastructure)	0 miles	5 miles	25 miles
Reduction in Metric Tons of CO_2 Emissions/Year	58,000	70,000	50,000
Anticipated Impact Area (New ROW)	1,700 ac	1000 ac	2000 ac
Stream/River Crossings	20 Public Water crossings 20 waters of the U.S.	10 Public Water crossings 10 waters of the U.S.	30 Public Water crossings 30 waters of the U.S.
Wetlands	400 ac	250 ac	600 ac
Forested Lands	800 ac	500 ac	1,200 ac
Agricultural Lands	400 ac	100 ac	300 ac
Federally managed property (specify name)	300 ac	300 ac	0 ac
State managed land (specify name) –	150 ac	50 ac	250 ac

Issue	North Macrocorridor Option 1	Central Macrocorridor Option 2	Macrocorridor Option 3 (non-federal lands)
Indian Reservation (specify name) - tribal-owned property	0 ac	0 ac	0 ac
Indian Reservation (specify name)	10 ac	700 ac	0 ac
Federal Listed Species (Known)	0	0	0
National Forest (specify name) Species of Concern	15 species	25 species	NA
State Listed Species (Known)	13 species	18 species	15 species
State Identified Natural Communities	1 avian community 0 plant communities	1 avian community 10 plant communities	1 avian community 5 plant communities
Other special / sensitive species (specify entity, e.g., tribe, BLM)	15 (tribe)	25 (tribe)	0
Historic Resources	5 Archeological 10 Historic	10 Archeological 15 Historic	5 Archeological 10 Historic
Environmental Justice Population of Concern	Yes[1]	Yes[1]	No
Socioeconomic Concern	Yes[2]	Yes[2]	No

[1, 2]Include footnotes, as appropriate, to further qualify an entry or specify source, etc.

6.0 PUBLIC INVOLVEMENT PROGRAM

Public participation requirements are found throughout the Council on Environmental Quality's (CEQ) regulations for implementing NEPA (40 CFR Parts 1500-1508), and the Agency's NEPA Implementing Procedures (Part 1970). Both sets of regulations describe specific requirements for preparing EAs and EISs, as well as broad goals for public participation in the NEPA process. Public involvement is also a critical aspect of the National Historic Preservation Act (NHPA) Section 106 process, its implementing regulations at 36 CFR Part 800. The Agency's NHPA implementing regulations (Part 1970 Subpart H and 1794) require consultation with appropriate State Historic Preservation Offices (SHPOs) and Tribal Historic Preservation Officers (THPOs), and development of a plan to involve the public in assessing the effects of its undertakings on historic and cultural properties. The type of public involvement will depend upon various factors including, but not limited to, the nature and complexity of the undertaking, the potential impact, and the likely interest of the public in historic preservation issues.

Consultation with agencies and in accordance with NEPA and the NHPA Section 106 requirements, in addition to public interaction beginning early in the siting process, provides

the opportunity to balance the interests of agencies, affected landowners and other stakeholders in an effort to minimize potential impacts and meet project objectives.

Public involvement is an important element in the corridor and route selection process, and obtaining public input early in this process provides an effective means of sharing important information, minimizing impacts to landowners and land use, and obtaining necessary project approvals. Such input should be sought from a range of stakeholders including federal, state, local agencies; tribes; landowners; etc., as well as any cooperating agencies that have been invited to participate.

Various public participation tools and techniques are available to provide relevant information to the relevant stakeholders and receive input on corridor development at each step in the process. These tools include but are not limited to: websites (project description, stakeholder notification, news releases), voluntary public meetings and corridor workshops or open houses, as well as required public meetings/hearings. **It is important that all federal, state and local agency interaction/correspondence and public meetings which occur prior to the initiation of the Agency's NEPA process be documented in the Macro-Corridor Study.**

6.1 Identification of Stakeholders

The first step to involve the public is to identify the stakeholders (people and organizations) who may be affected by, or have some other interest in, the project. Stakeholder involvement can help ensure valuable input and transparency in the process and minimize future opposition in final selection of the optimum corridor or route. Key stakeholders may include:

- Federal, state, and local agencies that would be issuing necessary permits, approvals, and/or concurrences in accordance with environmental regulations (e.g., U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, SHPO),

- State regulatory agencies, clearinghouses and the PUCs.

- Cooperating federal agencies for those corridors that may impact federal land or involve a federal permit and/or license; these could include, but are not limited to, the Federal Energy Regulatory Commission, U.S. Department of Energy, U.S. Department of the Interior.

- Indian tribes as required by NHPA Section 106 and government-to-government consultation requirements.

- Department of Defense military installations

- Other utilities

- Transportation authorities (rail, highway, airport)

- Landowners

- Local jurisdictions/communities - including municipal and county representatives (e.g., Chamber of Commerce) from each host county or town, as well as neighborhood/homeowners associations/residents from each development that the project may affect.

- Environmental groups, including national, state, and local environmental groups and public interest groups that are interested in the potential environmental impacts of the project, whether they are directly affected or not.

Note that the above list is an example of external stakeholders. Internal stakeholders are members of an applicant's internal siting team, including engineers, environmental specialists, real estate (land acquisition) specialists, etc.

A separate resource guide (Environmental Resource Information) is available that includes additional reference and contact information relating to external stakeholders.

6.2 Stakeholder Input in Weighting

If weighting is utilized in the macro-corridor development process, stakeholders must be actively involved in the weight assignment process. This necessitates conducting meetings to share important information, identify special concerns and siting constraints, check accuracy of the resulting suitability maps, support corridor and route refinement, minimize impacts to landowners and land use, and participate in assigning suitability values and weights to criteria used to evaluate and compare alternative corridors.

Stakeholder participation in the assigning of weights to each criterion or data layer that is evaluated ensures that the stakeholders' views are reflected in the determination of how important such variables are in the siting process. These weights and stakeholders are regionally specific and weight assignments must be performed in the region of the macro-corridor siting. If weighting is used in the selection process, the Agency requires that weighting must be accompanied by stakeholder input, and that such involvement must be documented in

the Macro-Corridor Study. It is also important that the weights be revisited and updated, if needed, for new projects to take into account possible changes in priorities.

6.3 Public and Agency Meetings

Public and agency meetings are integral to the evaluation of identified corridors, the identification and refinement of routes, and the selection of a preferred and alternative route(s) for detailed environmental analysis. Applicants are encouraged to contact stakeholders, agencies, and the public during the siting process, prior to the official start of public scoping under NEPA, which does not begin until publication of the Notice of Intent to prepare an EIS. Public and agency meetings are not required, however, until public scoping under NEPA begins (unless weighting is utilized).

Early contact is valuable in promoting public participation throughout the process, encouraging information sharing, identifying potential concerns and issues outside, and helping to develop public mailing lists. Affected landowners, and agencies should be contacted. Early meetings could be conducted and include workshops or an open house format to encourage one-on-one exchanges with stakeholders. The applicant may present preliminary macro-corridors to solicit input regarding issues of concern with a particular corridor and agency permitting requirements. Such an early exchange assists in refining those alternatives as well as determining the level of analysis necessary to address the issues relevant to the proposed project alternatives.

It is important that all federal, state, and local agency contacts and any public meetings be documented in the Macro-Corridor Study. Also, note that any meetings conducted during siting and prior to the scoping process, do not replace the agency's public scoping process under NEPA (see also the Agency's NEPA regulations at 7 CFR 1970).

6.4 Corridor and Route Refinement Meetings

The applicant may conduct additional public meetings, termed Corridor or Route Refinement Meetings, which allow additional public review and input on corridor and route options. The information gained from such meetings may be used for additional data collection and analyses to support further corridor or route refinement and alternative corridor analysis, and help select a preferred corridor and potentially an alternative route(s) for analysis in the Agency NEPA document. Such meetings are optional and, if conducted, would be captured as part of the NEPA process. Recent projects that provide examples for these meetings and useful maps include macro-corridor studies for the San Luis Valley Transmission Project (Huerfone, Alamosa

and Pueblo Counties, CO; Tri-State Generation and Transmission Association, Inc.); and the Bemidji-Grand Rapids 230-kV Line Project (Minnkota Electric Cooperative, Inc.) - all are available at Agency's website at: http://www.rurdev.usda.gov/UWP-eis4.htm). In addition, the Bureau of Land Management's San Juan Basin Energy Connect Project includes good examples of maps and route refinement workshops; the information is available at: http://www.blm.gov/nm/st/en/prog/more/lands_realty/san_juan_basin_energy.html.

7.0 SUGGESTED MACRO-CORRIDOR STUDY CONTENT AND FORMAT/OUTLINE

The following items should accompany or be part of the Macro-Corridor Study:

- Map of study area
- Maps of potentially unacceptable and undesirable areas within the study area's geographic boundaries
- List of all siting criteria used
- List of preparers and their disciplines
- List of all federal, state, and local agencies contacted and any meetings held
- List of references
- Summary of reference information
- List of maps and recommended alternative corridors
- Description of the methodology used for arriving at the macro-corridors
- Set of USGS 7-1/2' topographic quadrangle maps for the recommended macro-corridors.

The Agency also requires a summary description of the utility and any other project participants, description of the study area, and evaluation and summary of the results. All transmission macro-corridors considered should be identified, including those later dismissed from further consideration, along with the reasons for recommending or rejecting certain transmission corridors. A suggested outline for the Macro-Corridor Study is provided below.

Executive Summary

I. Introduction
   - o Basis for Study
   - o Environmental Review Requirements
   - o Environmental Review Process
   - o Utility or Cooperative
   - o Purpose and Need (briefly addressed with reference to Alternative Evaluation Study)

- Required Permits and Approvals
- Community Outreach and Public Involvement
- Format and Content of Document

II. Technological Alternative(s) Under Evaluation
- Results of Alternative Evaluation Study (briefly addressed with reference to Alternative Evaluation Study)

III. Macro-Corridor Study Methodology

IV. Study Area Definition/Determination
- Study Area Location and Characterization (this section will identify the study area location, include a general description of study area characteristics, and provide a listing of all resource areas considered/discussed in the document)

V. State Certificate of Need Corridors (if/where applicable)
- Development of Corridors
- Stakeholder Input
- Corridor Refinement

VI. Macro-Corridor Development
- Regulatory Requirements
- Electrical System Planning Requirements
- Macro-Corridor Resource Review
- Opportunities and Constraints Identification/Suitability Analysis
- Stakeholder Input
- Identification of Least-Risk Corridors (including existing corridors)

VII. Macro-Corridors Carried Forward for Consideration as Alternatives in the EIS
- Macro-Corridors Eliminated from Consideration
- Selection of Alternative Macro-Corridors

VIII. References

IX. Appendices [placeholder for additional information, such as glossary, maps and other graphic material, weighting workshop results, public comments, etc., as appropriate to a given study.]