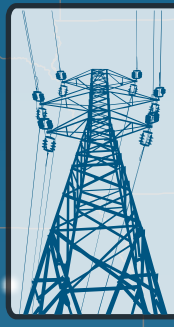
Eastern Interconnection Planning Collaborative



Eastern Interconnection Transmission Analysis

DOE Funding Opportunity DE-FOA-0000068

September 9, 2009

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Project Narrative

Eastern Interconnection Transmission Analysis
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Application for Financial Assistance Under
Funding Opportunity Number: DE-FOA0000068

Topic A

Interconnection-Level Analysis and Planning for the Eastern Interconnection

September 9, 2009
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This Project Narrative and all accompanying documents (excluding the Project Summary/Abstract File) are CONFIDENTIAL and include proprietary and sensitive business information.

Eastern Interconnection Transmission Analysis

1. Project High-Level Description

The Eastern Interconnection Transmission Analysis Project (the "Project") will be conducted in response to the U. S. Department of Energy (the "Department") Funding Opportunity Number DE-FOA 0000068 ("FOA"). This application is being submitted by PJM Interconnection, LLC on behalf of a multi-party consortium formed by a coalition of regional planning authorities - those entities listed on the North American Electric Reliability Council (NERC) compliance registry as Planning Authorities (PA) representing the entire Eastern Interconnection. This group of regional PAs intends to establish the Eastern Interconnection Planning Collaborative (the "Collaborative").

The Project as set forth in this submittal will be performed within the proposed structure of the Collaborative.[1] Deliverables of the Project include**:**

1. Working with state, provincial and federal policy makers and other interested stakeholders, reviewing existing regional plans on an interconnection-wide basis for consistency and compatibility as well as to enhance the future development of such plans;
2. Providing interregional and related scenario analyses for the entire Eastern Interconnection consistent with the guidance of the Stakeholder Steering Committee "SSC"; and
3. Conducting multi-constituency stakeholder workshops, webinars and other outreach initiatives to gather stakeholder input on scenario development and for both communicating initial results and soliciting input on findings and draft reports.

As outlined in this proposal[2], the Collaborative will conduct a process which:

- Builds upon existing models of the bulk power system and refines them as necessary to support interregional analysis of the combined regional plans for the entire Eastern Interconnection.
- Incorporates the current local and regional plans for the entire Eastern Interconnection.
- Performs analysis of the regional plans on an Interconnection-wide basis to identify greater opportunities for efficiencies.
- Provides an open and transparent stakeholder process to identify specific resource expansion scenarios to be studied. The stakeholder input from public workshops and other stakeholder forums will be taken into consideration by a multi-constituency stakeholder steering committee that includes, consistent with the Funding Announcement, at least a one-third representation of state officials.
- Performs analysis of the scenarios recommended by the SSC and endorsed by the states on an interregional basis for the entire Eastern Interconnection including the identification of potential transmission infrastructure enhancements to address those scenarios.
- Provides policy makers and regulators with current, complete, and technically sound information, vetted and reviewed with stakeholders, relating to potential transmission impacts associated with state, provincial, and national energy objectives. The Project will also provide an opportunity for policy makers and regulators to identify, in a timely manner, options to achieve those objectives.

[1] The Project is defined herein to meet the scope and time periods set forth in the Department's Funding Opportunity Announcement ("Funding Announcement"). It is intended that the Collaborative would continue an interactive Eastern Interconnection transmission analysis process beyond the period set forth in the Funding Announcement.
[2] Refer to List of Supplemental Attachments for a complete list of all related documents included with this Application.

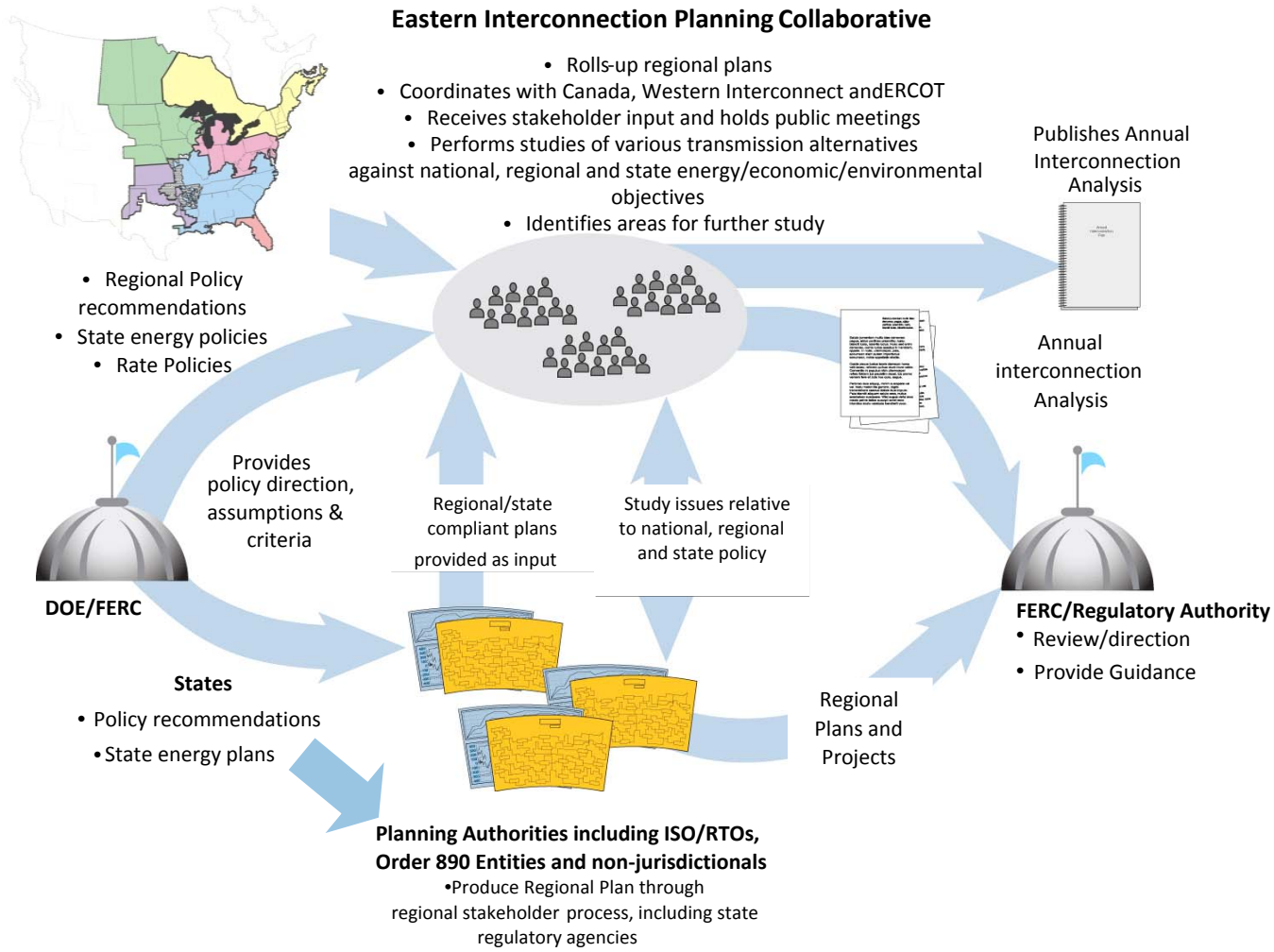
- Develops draft summaries and reports on the findings for use in an open stakeholder review and comment process.
- Publishes final summaries and reports, after considering the input received from the stakeholder process, and provides the results of the analyses to the Department, in accordance with the requirements of the FOA, as well as to the regional planning processes for consideration in enhancing regional plans.

The Collaborative is unique in that it represents a-first-of-its-kind effort by the Eastern Interconnection PAs to formally review existing expansion plans and future scenarios on an interconnection-wide basis in the Eastern Interconnection. Analyses undertaken will inform policy makers and stakeholders regarding future expansion options and also the potential implications of changes stemming from proposed legislation or other policy initiatives.

2. Overview of the Collaborative

The Collaborative was initiated by a coalition of regional PAs - which entities are listed on the NERC compliance registry as PAs representing the entire Eastern Interconnection. The Collaborative provides a grass-roots approach which builds upon the regional expansion plans developed each year by regional stakeholders in collaboration with their respective NERC PA. The Collaborative will work with regional and national stakeholders, states, and provinces in the Eastern Interconnection to create a multi-constituency stakeholder steering committee. The SSC will provide strategic guidance for the scenario development and analysis work, which will be performed under the direction of the collaborating resources of the NERC PAs. The Collaborative will also provide a process to achieve state endorsement of the scenarios to be studied to ensure their usefulness to policymakers and their respect for regional needs. Figure 1 below provides a high level graphical description of the Collaborative process.

Figure 1: EIPC High Level Overview



The Collaborative was founded to be a broad-based, transparent collaborative process among all interested stakeholders: state, provincial and federal policy makers, consumer and environmental interests, transmission planning authorities and market participants generating, transmitting or consuming electricity within the Eastern Interconnection. The Collaborative envisions the preparation of detailed interconnection-wide technical analyses of potential transmission infrastructure improvements to meet various scenarios provided by a SSC made up of representatives of state, provincial, and federal policy makers and other stakeholder interests. In addition, the Collaborative, through its stakeholder process and input from states and provinces, can provide a platform for interconnection-wide collaboration on identification of various policy options (or alternatives) and the transmission infrastructure associated with such alternatives. Finally, the Collaborative's work as detailed in this bid in reviewing and harmonizing existing regional plans on an interconnection-wide basis will serve as an essential "building block" to greater interconnection-wide planning coordination.

The Collaborative utilizes a Technical Support Group (TSG)[3] comprised of transmission planners from each PA. The PAs will provide coordinated interregional analysis for the entire Eastern Interconnection guided by the consensus input of an open and transparent stakeholder process. A broad-based stakeholder process enables the analysis to incorporate and reflect existing and possible future resource choices and commitments. This proposal, if accepted by the Department, will provide the Collaborative with the resources and opportunity to analyze, in depth, specific expansion scenarios presented by stakeholders through the SSC. While the Collaborative was originally intended to commence with a focus on a roll-up and review of existing approved transmission plans, the availability of funding under the American Recovery Reinvestment Act (ARRA) would allow the Collaborative to "jump-start" an expanded process which includes more detailed scenario analyses to inform energy policy decisions.

3. Project Overview

The Project represents a first-of-its-kind effort, to involve PAs in the Eastern Interconnection to model the impact on the grid of various policy options determined to be of interest by state, provincial and federal policy makers and other stakeholders. The Project will also include an expansive facilitated stakeholder process for the entire Eastern Interconnection, where (1) expansion scenarios can be developed by stakeholders including state, provincial and federal policymakers, and (2) the technical transmission analysis undertaken by the Principal Investigators (PIs, as further described below) will be reviewed and discussed in an open process with all policy makers and stakeholders within the Interconnection. Interactive communications technology will be used to facilitate such participation, wherever possible, to reduce individual entities' costs to participate.

The Project will build upon, rather than substitute for, the current local and regional transmission planning processes developed by the PAs and associated regional stakeholder groups within the entire Eastern Interconnection. Those processes, and the resulting transmission expansion plans, are developed in accordance with the requirements of federal, state, and provincial jurisdictions and have been determined by the respective PAs to meet the NERC Reliability Criteria[4]. Those processes will be informed by the Collaborative efforts with the interconnection-wide review of the existing regional plans serving as a direct input into the development of those regional plans as noted in the above diagram.

The PIs for the Project will be made up of eight PAs of the Collaborative who have been NERC-certified and have signed the EIPC Analysis Team Agreement[5] ("EIPC Agreement"). Although all participants in the EIPC Analysis Team are not applicants (applicants/PAs are identified in Section 10 of this narrative), each participant will actively contribute to the Collaborative process in accordance with the EIPC Agreement. The commitment of the PAs is further evidenced by the Letters of Commitment included with this application.

[3] Refer to the EIPC Analysis Team Agreement submitted as a separate "Optional Other Attachment" with this Application.
[4] See, for example, NERC Reliability Standards related to Transmission Planning (TPL-001 to TPL-004). In addition, those Transmission Planners subject to the jurisdiction of the Federal Energy Regulatory Commission (FERC) have planning processes in place which have been accepted by the Commission as meeting the requirements of FERC Order No. 890.
[5] Refer to the EIPC Analysis Team Agreement submitted as a separate "Optional Other Attachment" with this Application.

The PIs and two of the subcontractors, Charles River Associates (CRA) and Oak Ridge National Laboratory (ORNL), together will undertake the steps associated with developing the modeling capability necessary to support analysis for the entire Eastern Interconnection. The Keystone Center will be subcontracted to assist in the formation and facilitation of a multi-constituency SSC, informed by an open stakeholder process.[6] The SSC will provide strategic guidance on the key policy assumptions and the scenarios to be examined by the Collaborative's Technical Support Group. The results of that modeling, as well as the steps in preparing the model, will be transparent and shared with the SSC and the stakeholder community. Such information, developed through the Collaborative, will then provide key information which could be helpful to state, provincial, and federal policy makers in the exercise of their statutory responsibilities.

The PIs will perform an assessment of alternative expansion scenarios that will include both a detailed transmission analysis and production cost modeling.[7] Each alternative expansion scenario to be evaluated will include alternate resource options, load forecasts, regional interchange assumptions and other criteria required to model the scenario along with potential transmission expansion options.

The approach will allow coordinated modeling of the interregional interactions and transmission configuration impacts of both the existing approved regional plans and the alternative expansions developed in response to the selected scenarios. The analysis will include reliability evaluations consistent with the numerous requirements of NERC and regional reliability standards. The analysis will also build upon regional load conditions, resource selections, operating constraints and demand-side options. Hourly energy-based analysis is useful in the evaluation of renewable energy resources, where available supply may not be coincident with peak demand. This coordinated interregional approach to interconnection-wide planning will enable evaluation of a wide range of renewable resource options, some of which are found in remote areas not currently accessed by robust, high voltage transmission infrastructure. The PIs also intend to provide a production cost analysis of the various alternative transmission upgrades so that the economic impact of such upgrades on overall energy prices can be seen. Combining the results of these two processes is designed to provide policy makers and stakeholders with quality information, developed by those entities with the responsibility to plan and operate the transmission grid, concerning the cost and reliability impacts of alternative upgrades consistent with various identified scenarios.

The analysis will identify, at a high-level, alternative transmission expansions in response to various scenarios identified through the Collaborative's stakeholder process. The focus will be on the high voltage transmission system, which is generally considered to be those facilities operated at 230KV and higher voltage levels. The PI's analysis will not be proposing the specific routing or construction of these transmission lines. As a result, it is not intended that the analysis will address environmental or siting issues associated with particular lines and routes. In short, the Project is intended to provide high level interconnection-wide analysis, not substitute for the more detailed regional planning processes or siting processes undertaken in accordance with state, federal and provincial law. It is these latter processes that consider siting and environmental issues. This delineation of the role of the Project and its relationship to existing regional planning processes (as well as its relationship to state and provincial siting processes) is fundamental to this proposal.

[6] At least one-third of the SSC will be comprised of State Officials.

[7] As noted in Section 5 below, the number of scenarios to be run will necessarily be bounded by the amount of funding available for this activity as determined by the Department. The PIs have priced this activity on a "per scenario" basis in order to assist the Department in its deliberations on this point.

4. Project Objectives

The objective of the Project is to establish an ongoing process for integrating the regional transmission expansion plans of the entire Eastern Interconnection in a manner which facilitates the timely and efficient expansion of the transmission system to serve the needs of electrical customers. A detailed review of the project objectives is provided in the Statement of Project Objectives in Section 14.

The Project will provide the following benefits:

- Establish an ongoing process, which builds upon and integrates with annual local, regional, and interregional planning activities, to improve interconnection-level coordination and analytical support for long term policy determinations.
- Create an open and transparent multi-constituency stakeholder process to solicit options and to review the results of the modeling of alternative scenarios. The proposal calls for the creation of a SSC in accordance with the FOA which will be charged with synthesizing broader stakeholder input and working through consensus to identify a select set of scenarios to be assessed.
- Provide transparent modeling and analysis of the various alternative expansion scenarios identified by the SSC. Coordination with the underlying transmission and distribution systems and compliance with NERC reliability criteria are embedded in the regional plans.
- Provide indicative information for potential future alternative transmission development based on the stakeholder scenario input. Such analysis will include:
    - Current state and federal requirements (as of the date of the analysis underlying the plan(s)) for renewable energy goals, energy efficient goals, and goals for reducing greenhouse gas emissions.
- In the longer run, such interconnection-wide analysis will:
    - Assist in minimizing the long-term costs of producing and delivering electricity to consumers.
    - Provide a path for greater interconnection-wide coordination of grid development, and
    - Better inform industry planners and policymakers of the potential efficiencies, collaborative opportunities and policy impacts.

Although the PIs believe the Project will provide valuable tools for policymakers to develop policies which meet various energy security and energy independence national goals included in the ARRA and various provisions of federal law, the PIs do not represent that this bid, in and of itself, will have a significant short term economic stimulus effect on the local, regional or national economy. The PIs will meet all applicable reporting requirements under the ARRA.

5. Proposal Cost Structure

The PI's proposal to accomplish the above goals is set forth below and in the attachments to this proposal. The PIs propose to employ the services of CRA, ORNL and The Keystone Center to assist with the Project. The PIs have also included as part of this bid a macroeconomic analysis of various exogenous factors such as carbon prices on the resource mix available in the Eastern Interconnection. This macroeconomic analysis, to be performed by CRA, is intended to assist the SSC in evaluating these factors and other potential policy options, at a high level, in advance of selecting alternative scenarios for further analysis.

In addition to the expenses for the PIs and the primary subcontractors, the Project budget includes funding for seven PAs in the Eastern Interconnection that are seeking recovery of an amount less than $100,000 for their contribution to the Project plus an allowance for travel costs and other expenditures to enable representatives of relevant non-governmental organizations (NGOs) to participate. The Project budget also includes funding for opportunities related to the enhancement of educational criteria through key universities within the Interconnection in the areas of training programs and application development for transmission planning engineers.

The costs to perform detailed analysis of particular scenarios of interest to the SSC are priced on a per scenario basis.[8] This approach was taken to allow the Department the ability to choose the extent of transmission scenario analyses to be completed within the constraints of available funds. It also provides flexibility in the selection of a workable number of scenarios rather than having the PIs arbitrarily propose a set number of scenarios in advance. The PIs request that the Department specifically address its willingness to fund these separate components of the bid and the respective level of such funding so this up front guidance is available for all participants.

6. Transmission Planning and Analysis

Power Systems Background

In an ideal power system, safe, clean, and reliable generation would be economically located in close proximity to customer loads. Such distributed generation would provide reliable service with minimal line losses and would lessen the need for enhancements to the existing transmission and distribution infrastructure. However, land-use, location of available resources, environmental regulations and related cost issues limit the availability of mass scale distributed generation. In addition, the characteristics of certain renewable resources, in many instances, necessitate the placement of generation sources distant from load centers. For these reasons, economical transmission expansion remains a key component of accessing generation options to meet the nations' reliability, economic and environmental goals.

Transmission Planning Process

Transmission planning is an ongoing, iterative process which relies upon the collaborative efforts of transmission planners, regulators, public policy makers and other stakeholders. In general, there is no single fixed transmission plan either for the interconnection as a whole or for the individual system of any particular Transmission Owner. Rather than remaining fixed, transmission plans are developed as a dynamic series of plans that are typically updated annually and extend 10 years or further into the future (Planning Horizon). These planning portfolios, developed to meet extensive, system performance, and reliability criteria, include yearly expansion projects timed to meet transmission needs as they arise in the Planning Horizon.

Each year's planning portfolio builds upon the previous years, but can change based on changing system conditions and other exogenous factors. The key drivers of transmission needs are customer loads, availability of generation and demand response resources, dispatch patterns, and interchange between regions. Because these drivers can and do change each year, transmission plans are re-evaluated on an annual basis to reflect actual system performance and changes in forecasts (loads, resource selections, fuel costs, etc.).

[8] Refer to the EIPC Total Project "Budget Justification File" included with this Application.

Transmission planning is a process that utilizes local knowledge of loads, resource selections, operating constraints, and demand-side options to accurately model and plan for the facilities needed to reliably serve customer loads. Stakeholders as well as policy makers at the state, provincial and federal level significantly influence both the transmission needs and also the options available to address them. The Federal Energy Regulatory Commission (FERC) has established criteria to ensure the openness and transparency of planning processes for transmission planners within its jurisdiction.[9] The FERC requirements stress openness, transparency and clearly-identified criteria to govern the planning process. All of the FERC-jurisdictional entities participating in this proposal have Commission-approved planning processes under FERC Order No. 890. By the same token, public power entities, as well as Canadian entities, extensively engage stakeholders and policymakers as part of their planning processes.

Regional Coordination and Modeling

Coordination with neighboring systems is a key component of an effective transmission planning process. Since neighboring systems obviously cannot communicate their plans before they are developed, regional coordination is an iterative process of working with neighboring systems to learn their plans and adjust accordingly.

Extensive coordination already goes into the development of the existing regional and interregional transmission plans. Local processes develop detailed modeling and analysis based upon stakeholder inputs. The Eastern Interconnection Reliability Assessment Group (ERAG), formed by agreement of NERC Regional Entities in the Eastern Interconnection, facilitates the development of regional models and analysis, including the development of ERAG Multi-regional Modeling Working Group (MMWG) models representing the entire Eastern Interconnection. In addition, interregional agreements remain in place to ensure coordination over very large portions of the Eastern Interconnection. Such agreements cover both coordination of planning across Regional transmission Organization (RTO) boundaries and among public and investor owned systems. (E.g. PJM/MISO/TVA Regional Planning Agreement and Northeastern ISO/RTO Coordination of Planning Protocol)

Opportunity for Increased Coordination

Although, as noted above, coordination has long existed in the Eastern Interconnection, the potential integration of large amounts of renewable resources offers great opportunities and significant challenges. Expanding upon existing processes to coordinate analysis among multiple regions would enhance current transmission planning activities. The Project will provide a platform to expand those coordination efforts.

[9] Preventing Undue Discrimination and Preference in Transmission Service, Order No. 890, FERC Stats. & Regs. ¶ 31,241, order on reh'g, Order No. 890-A, FERC Stats. & Regs. ¶ 31,261 (2007), order on reh'g, Order No. 890-B, 123 FERC ¶ 61,299 (2008), order on reh'g, Order No. 890-C, 126 FERC ¶ 61,228 (2009).

7. Merit Review of Criterion Discussion

The Project meets each of the merit review criterion and sub-criterion noted in Section V.A of the FOA as described in the tables below.

Criterion 1: Impact & Technical Understanding (40%)

#	**FOA-0000068 Criterion**	(See Process Detail in Section 14)
1-1	Degree to which the Applicant demonstrates a thorough understanding of resource assessment, transmission capacity, facilities and related technologies needed to maintain electric reliability in an interconnection under a wide range of alternative futures	The participants are all NERC registered PAs who possess a thorough understanding of resource assessment, transmission capacity, facilities and related technologies on their respective systems. All of the PAs also coordinate transmission planning with neighboring systems and many have broader interregional planning agreements already in place. The PAs have a legal obligation to plan for the continuing reliable operation of the interconnected grid over an extended planning horizon. The Project methodology will draw heavily on proven models and planning methods built to analyze economic and reliability impacts on the interconnection under a wide range of alternative futures.
1-2	Degree to which the long-term transmission plans achieve and balance the following objectives:	The approach of the Project as outlined in Section 14 is to build from the existing regional plans and processes as a platform for assessing potential impacts and identifying potential options related to scenarios of interest. The regional plans, developed through extensive bottom-up analysis and stakeholder coordination, directly address the criteria of 1-2.a-f and also provide a sound basis for the Project's scenario analyses. Subsequent regional plans are anticipated to incorporate viable options identified through the Project's scenario analysis. Please see sub criteria below.
1-2a	Satisfy all reliability standards approved by FERC	PAs have a current responsibility to plan their systems in accordance with the FERC or provincially approved reliability standards promulgated by NERC, as well as regional or local criteria as applicable. The regional plans result from these reliability compliance activities.

#	**FOA-0000068 Criterion**	(See Process Detail in Section 14)
1-2b	Consider all available technologies (to the extent that they may become economic) for electricity generation, energy storage, transmission, end-use energy efficiency, demand management, and management of transmission- and distribution-level facilities	Regional plans include an extensive array of technologies and applications. In addition, available technologies for inclusion in the analysis will be vetted through the stakeholder driven scenario development process. Project team expertise, including the PAs supplemented by personnel from CRA and ORNL, as well as broad stakeholder involvement will ensure proper consideration of available technologies in the scenario development and analysis review processes. Moreover, many of the PAs are heavily involved in monitoring and testing of new technologies. A number of the PAs have participated in federal and state demonstration projects for various new generation, transmission and demand response technologies including deployment of Smart Grid technologies.
1-2c	Satisfy all current state and federal requirements for renewable energy goals, energy efficiency goals, and goals for reducing greenhouse gas emissions	PAs have a current responsibility to plan their systems in accordance with all current state, provincial, or federal requirements. Scenario development guided by the SSC with endorsement of state representatives will also enable assessments of potential state and federal requirements for renewable energy goals, energy efficiency goals and goals for reducing greenhouse gas emissions. All PAs are familiar with the current state and federal requirements applicable to their regions and take such into account in conducting their current planning functions. State endorsement of the scenarios will ensure consideration of current state energy and environmental goals.
1-2d	Minimize long-term electricity supply costs	PAs have a current responsibility to plan their systems to ensure system reliability and to expand the transmission system in an economical manner. The regional plans reflect the economical expansion of the grid to reliably meet the supply decisions made by grid participants, which are subject to economic, environmental, and other factors. The scenario development and system analyses process outlined in Section 14 provides for economic evaluation of scenarios to identify additional potential efficiencies. These comparative analyses include the use of security constrained economic dispatch applications as well as evaluation of overall transmission and generation capital costs. These analyses will provide policymakers with valuable information regarding the potential costs of various policy directions.

#	FOA-0000068 Criterion	(See Process Detail in Section 14)
1-2e	Minimize the overall long-term impacts of electricity supply activities on the environment	The regional plans reflect the cumulative transmission decisions and supply decisions made by grid participants and endorsed by the states to minimize the environmental impacts of transmission facilities and supply choices on the environment, subject to reliability, economic, and other factors. The scenario development and system analyses process outlined in Section 14 allows for a wide range of environmental conditions, parameters, and sensitivities to be modeled. The production costing model will provide information that can be used to forecast emissions and other impacts on the environment
1-2f	Provide a path for efficient grid development (e.g., build fewer but larger long distance transmission lines)	The Project performs reliability and economic energy analysis on an interconnection-wide basis for the regional plans and for each expansion scenario to identify potential efficiencies in transmission expansion. One component of the energy analysis forecasts how much energy as defined by the scenarios will be transferred from production areas to load centers. Once this information is determined, it is used to size transmission facilities to provide efficient options for each scenario studied.
1-3	Degree to which the Applicant's proposed analysis and long-term plan(s) cover the entire interconnection and presents an integrated approach and give adequate consideration to the merits of alternative configurations of the interconnections Extra High Voltage (EHV) AC and DC networks	The Project will begin with a roll-up and interregional analysis of existing regional plans on an Eastern Interconnection-wide basis. This will also provide the platform for the stakeholder driven scenario analysis. The proposed development process is designed to develop transmission options for each of the scenarios of interest. These options for each scenario are developed through a coordinated evaluation that considers regional drivers and interconnection-wide impacts. Options consider the appropriate application of both AC and DC EHV alternatives as determined necessary to meet scenario objectives.

Criterion 2: Technical Approach and Project Management (35%)

#	FOA-0000068 Criterion	(See Process Detail in Section 14)
2-1	Adequacy and feasibility of the Applicant's approach to ensure that a broad and diversified range of scenarios and sensitivity cases are identified for study	The Project provides for an exceptionally qualified team of industry experts in electric power system technical and planning analyses, macro and micro economic analyses and stakeholder facilitation. This team coupled with the broadly diversified SSC, including the Eastern States and Canadian provinces, will ensure that a sufficiently broad and diversified range of scenarios and sensitivity cases are identified for study and evaluated appropriately.

#	**FOA-0000068 Criterion**	(See Process Detail in Section 14)
2-2	Adequacy and feasibility of the Applicant's approach to address and resolve the most technically challenging aspects of developing long-term interconnection-wide transmission expansion plans	The integrated and coordinated interregional approach, combined with the "bottom-up" base plan development approach is specifically designed to identify interregionally coordinated transmission expansion options by scenario. The options are then refined by stakeholder review and input to enable critical policy decisions impacting future transmission development. Finally, the results of this interconnection-wide analysis will also be made available to the regions for consideration in their local planning processes.
2-3	Appropriateness, rationale, and completeness of the proposed Statement of Project Objectives (SOPO)	Refer to Section 14 for the Statement of Project Objectives (SOPO) which demonstrates that the Project will meet or exceed the requirements of the Task A of the FOA.
2-4	Adequacy of the Project Management Plan (PMP) to successfully accomplish project objectives (defined in SOPO) on time and within the proposed budget	This Project will be managed by a full-time Project Manager with experience in leadership of large complex projects supported by staff resources for project coordination, record keeping, and reporting. The Project Manager will be assisted by the project management resources provided by each of the PIs. Time reporting and milestone tracking tools will also be employed to minimize the risk that Project objectives are not being achieved in a timely manner. The PIs will track the effectiveness of the overall project management process through monthly progress reports and quarterly progress meetings, and provide any additional project management resources needed to ensure the Project is managed efficiently.
2-5	Adequacy of the Applicant's assessment and proposed mitigation of risk (due to technological uncertainties that could have major effects on future transmission requirements) in long-term plan(s)	The Project will engage the SSC in the identification of uncertainties that will be incorporated into scenario and sensitivity analyses as a means to identify relative robustness of transmission options aligned with scenarios. The PIs will be aided in addressing technological uncertainties by expertise provided by ORNL.
2-6	Adequacy and feasibility of the Applicant's approach to enable representatives of relevant non-profit, non-governmental organizations to participate in the development of interconnection analyses and planning	The process outlined in Section 14 is specifically designed to foster participation from broad stakeholder groups and to give each sector a forum to voice its views. The proposal includes specific funding to support the participation by NGO representatives on the SSC and Stakeholder Work Groups to be formed. In addition, the bid anticipates use of webinars and other web-based communication to limit the travel costs that any party incurs in participating.

#	**FOA-0000068 Criterion**	(See Process Detail in Section 14)
2-7	Degree to which the project would be performed in a transparent and collaborative manner, and study processes would be open to significant stakeholder bodies, including appropriate entities in Canada and Mexico	The proposed process outlined in Section 14 provides for broad stakeholder outreach through regional workshops at several critical stages of the process, the creation of a representative stakeholder steering committee in accordance with the FOA, the formation of stakeholder technical work groups to facilitate communication between the SSC and the broader stakeholder community, open meetings of the SSC and a website and other electronic outreach to provide access to all documents, meeting summaries and activities of the Project. The Keystone Center, a professional mediation and facilitation organization, will provide expertise on stakeholder process formation and will facilitate stakeholder interactions to achieve consensus of the SSC. Canadian planning entities will participate in the Project as evidenced by the letters of commitment included in the Application. The Collaborative intends to utilize data from Canadian entities and to ensure communication with Canadian planning entities throughout this process.
2-8	Degree to which the Applicant's approach would lead to consensus (as much as possible) among the stakeholders on key issues	Consensus begins with clear guidelines for deliberation among the parties, continues with facilitated dialogue, and culminates in a better understanding of the joint interests of the diverse stakeholders. Consensus means that the outcomes or recommendations taken as a whole are acceptable to all the parties and have been achieved through careful consideration of the diverse interests of the stakeholders. The Keystone Center will facilitate effective collaborative processes and guide discussions of the issues in a manner that builds trust and openness among the participants and ensures that all interests of the parties are heard and fully explored. Consensus may not be possible on all issues and by acknowledging where there are equally important differences of opinion, Keystone will utilize its facilitation experience and meeting summaries to delineate the range of positions where consensus is not reached.

Criterion 3: Relevant Experience, Capabilities and Organization of the Project Team (25%)

#	**FOA-0000068 Criterion**	(See Process Detail in Section 14)
3-1	Credentials, capabilities and experience of key personnel	List of team members and resumes of key personnel is included as a part of the bid package
3-2	Demonstrated experience of the project team (Applicant, consultants, subcontractors) in performing analysis and planning on power systems	List of team members and resumes of key personnel is included as a part of the bid package
3-3	Clarity, logic and likely effectiveness of project organization	The project organization outlined herein will create an effective structure that will enable participation by a wide-range of industry experts, including transmission owners, independent system operators (ISOs/RTOs), non-government organizations (NGOs), state, provincial, and federal regulators and academics. See attached Project Management Plan as well as Sections 9 and 10 below. The applicants have proposed a project organization and work plan approach which is designed to ensure an orderly approach and timely and effective outcomes while still allowing for significant stakeholder input and participation.
3-4	Adequacy and composition of the multi-constituency steering group to provide strategic guidance to the Applicant	Refer to FOA Criterion 2.7 and 2.8 above for details on the general stakeholder participation and the formation and intended purpose of the SSC.
3-5	Degree of commitment of the project team as evidenced by letters of commitment from team members	Letters of commitment from team members are included as a part of this bid package. These letters also include commitments of support from Eastern Interconnection PAs who are not seeking federal funding at this time but pledge to cooperate with and participate in the Collaborative.
3-6	Ability to deliver programmatic result and accountability objectives included in the American Recovery and Reinvestment Act of 2009	Through the terms of the EIPC Agreement among the EIPC participants, the PIs and PAs have provided a legal structure to govern delivery of programmatic results and the reporting and accountability required under the ARRA. The expertise of the PAs in grid planning, which is already part of their core missions, as well as the detailed project plan set forth in this bid are central to the delivery of the programmatic results. Moreover, the Project will retain a full-time project manager with industry expertise to manage the day-to-day operations of activities funded by the FOA.

8. Relevance and Outcomes/Impacts

The Project addresses Interconnection-Level Analysis and Planning for the entire Eastern Interconnection through establishing a comprehensive transmission analysis process combining the efforts of the NERC PAs with an open and transparent collaborative process with stakeholders and

state and federal policy makers. The Project engages the NERC PAs in a "bottom-up" process which utilizes, as a base case, the current coordinated regional plans of each of the PAs, and assesses a finite set of scenarios of interest to states and other stakeholders. Such analysis provides critical information to inform policymakers in their choices of future policies affecting resource choices and will also be provided for consideration by the regions as they update their respective plans.

Areas of particular relevance to the objectives of the program:

- NERC PAs for each geographic region of the Eastern Interconnection are active participants in the Collaborative including all of the RTOs and ISOs.
- The Project engages a SSC to determine the specific scenarios to be assessed. The formation of the SSC will be stakeholder driven through a process facilitated by The Keystone Center. The applicants commit that at least one third of the SSC members will be representatives of states as per the FOA. This proposal is also requesting that federal funding be provided to enable NGO organizations to serve on the SSC if the stakeholders so determine.
- All SSC meetings, conference calls, and other events will be open to the public. All materials will be posted on a public website to be developed and maintained as a key vehicle for communication among the Collaborative participants. Web conferencing and webcasts will be used whenever appropriate so as to allow maximum participation while reducing individual stakeholder travel costs. Certain modeling and other data obtained from the regional planning processes necessary to provide quality analysis will be publicly available subject to FERC or other legal requirements related to the treatment of Critical Energy Infrastructure Information (CEII) and Confidential Information and modeling vendor requirements.
- The analysis will build upon the local and regional transmission plans developed by the respective NERC PAs to meet the NERC and regional reliability criteria related to transmission planning. As a critical step in the analysis, the PAs will harmonize the existing regional plans through a "roll up" and analysis, on an interconnection-wide basis of the existing regional plans. A particular advantage of th**e** Project is its "bottom-up" approach building upon regional expansion plans rather than simply overlaying new lines without consideration of the characteristics and operation of the existing underlying system. The PAs will detail to the stakeholders the existing regional plans which have been designed, on a regional basis to:
    - Reduce the long-term costs of producing and delivering energy to their customers.
    - Meet all current state and federal requirements for renewable energy goals, energy efficiency goals, reliability and carbon and other emissions requirements.
    - Reduce the long-term impacts of electric supply activities on the environment.
- The Project will provide practical interconnection-wide analysis for the specific resource selections made by Load Serving Entities (LSEs) on behalf of their customers, and also for the particular scenarios developed by the multi-constituency SSC to inform LSEs, policy makers, and other stakeholders of alternatives to existing plans. The Project will address a wide range of technology uncertainties as part of their analysis of the scenarios selected by stakeholders through the SSC. EHV AC and DC options will be considered along with conventional technologies and applications of advanced technologies to address system needs.
- This proposal provides a macroeconomic analysis to be performed by CRA. This analysis provides a valuable tool for the SSC and stakeholders to evaluate renewable resource options such as on- and off-shore wind, solar, biomass, and ocean energy, low-carbon resource options such as nuclear, Integrated Gasification Combined Cycle (IGCC), and Carbon Capture and Sequestration (CCS), and distributed resources. The Project will also assess

storage options, energy efficiency, and demand resources as specified by LSEs or selected for analysis by the SSC.
- As noted in Section 5, the Collaborative will utilize ORNL and key universities within the Eastern Interconnection in satisfying Tasks 7 and 8 for Topic A as outlined in the FOA.

Expected outcomes:

- The SSC will provide a consensus recommendation for the selection of scenarios, which will result in the analysis performed by the NERC PAs serving to provide key analytical inputs for use by policy makers in the Eastern Interconnection.
- The interregional and scenario analyses will harmonize the existing regional plans on an interconnection-wide basis. This information will ensure that the existing regional plans have fully taken into consideration both opportunities and impacts from grid enhancements in regions throughout the interconnection to the extent such activities impact the proposed regional plans.
- Accurate and consistent modeling and tools will be available to support transmission planners and other stakeholders in performing analysis of various expansion scenarios and their impact on the Eastern Interconnection grid.

9. Roles of Participants

The Project will be conducted using a multi-investigator approach with the PIs identified in Section 10 of this Project Narrative. In addition to the PIs listed in Section 10, CRA, ORNL and The Keystone Center will serve as subcontractors for the Project providing expertise in the areas of economic analysis, power system modeling and facilitating stakeholder activities respectively.[10]

PJM Interconnection, LLC ("PJM") will serve as the Contact PI as well as the Lead PI for the Project. In its role as Lead PI, PJM will have responsibility for coordination among the remaining PIs and the subcontractors. To ensure timely and efficient performance of the actions set forth in this bid, PJM will retain a full-time Project Manager to provide overall project coordination and communication among the PIs, subcontractors and the EIPC Analysis Team, throughout the Project.

The relationship, organization, and responsibilities among the EIPC Analysis Team, including the PIs are outlined in the attached EIPC Agreement. The PIs will utilize the organizational structure and processes included in the EIPC Agreement for making decisions on all aspects of the Project including, but not limited to: scientific/technical direction, publication of results, intellectual property issues, and communication plans.

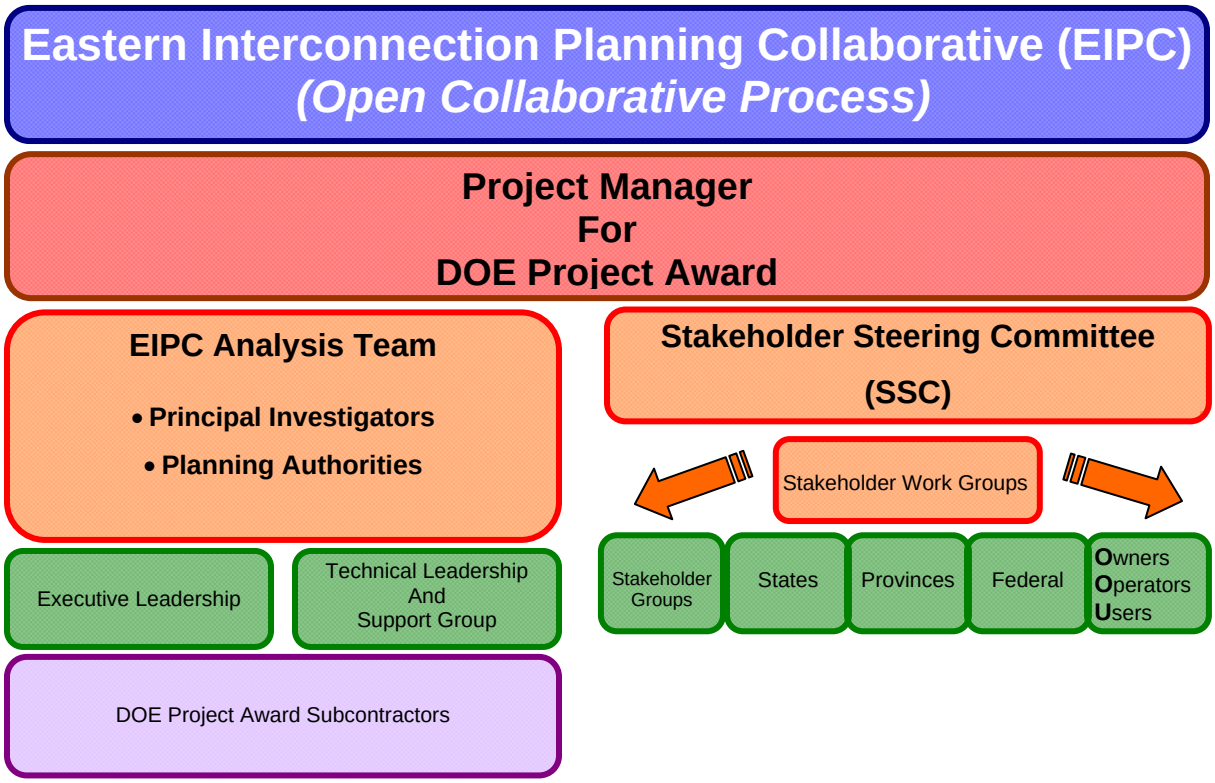
PJM, functioning as the Lead PI and working through the Project Manager, will serve as the primary contact with the Department on contract issues and will be responsible for filing required reports, updates, and addressing administrative issues. All PIs will be responsible for providing resources described in the proposal and the necessary information required for the Project Manager and PJM to prepare and file the necessary reports to support this project.

[10] The Non-PI Planning Authorities participating in the EIPC Agreement will add value to this proposal by providing input and expertise relative to their respective service territories.

Project Organization:

The PIs will engage the SSC, stakeholders and the EIPC Analysis Team through the structure outlined and described in Figure 2.

Figure 2: Project Organization and Structure



- The **Stakeholder Steering Committee (SSC)** will provide strategic guidance on the scenarios to be modeled, key assumptions for the scenarios and feedback on the modeling results. The SSC will also work with the PIs to review the results of the grid analysis based on the respective scenario and provide critical input to the reports to be provided to the Department under the Funding Announcement. The SSC is a multi-constituency group with at least a one-third representation of state officials as specified in the Funding Announcement**.**
- The **Project Manager** will plan, develop, control and manage the day-to-day activities of the project and coordinate all activities among the Project participants.
- The **EIPC Analysis Team** will be responsible for developing the modeling capability necessary to support analysis for the entire Eastern Interconnection so as to provide policy makers with a comprehensive interconnection-wide analysis.
- **State Topic B** Coordination---The PIs believe this structure is consistent with structures the states may be proposing in their response to the Funding Announcement Topic B. As outlined in Section 14 below, the PIs believe that the overall process should include a provision for state endorsement of the scenarios to be studied and an overall structure which ensures that no single region's plans can be ignored in the absence of consensus. The PIs have not proposed the details of how that state endorsement is conducted so as to leave room for the State Topic B submittal to

be harmonized with this proposal.[11] The PIs look forward to working with the states and the stakeholders to ensure a harmonious efficient process during the initial start-up of the Collaborative.

The management and coordination among the PIs and the other EIPC participants is outlined in the Coordination and Management Plan found in Section 10 of this narrative. The EIPC Analysis Team is comprised of NERC Planning Authorities in the Eastern Interconnection and structured as follows.

- Executive Committee – Addresses governance, manages finances, and provides guidance to the Collaborative Technical Committee.
- Technical Committee – Directs the work of the Collaborative TSG.

Although all participants in the EIPC Analysis Team are not applicants (applicants/Principal Investigators are identified in Section 10 of this narrative), each participant will actively contribute to the Collaborative process in accordance with the EIPC Agreement. The commitment of the PAs is further evidenced by the Letters of Commitment included with this application.

Key activities of the EIPC Analysis Team include the following:

- Establish work teams, establish an annual schedule, and identify resources (manpower, computer facilities, etc.) necessary for completing the EIPC Analysis Team activities.
- Model the Eastern Interconnection bulk power system as required for performing planning analyses of the combined regional plans of the participants.
- Analyze the combined plans to identify inconsistencies and opportunities for efficiencies.
- Provide a forum and public workshop process for the EIPC Analysis Team to receive input from interested stakeholders, in particular ensuring the role of federal, state and provincial officials.
- Complete analysis work on the priority scenarios developed in coordination with the SSC, state and provincial representatives and the public workshop process.
- Provide policy makers and regulators with current, complete, and technically sound information relating to potential transmission impacts associated with state, provincial, and national energy objectives and provide an opportunity for policy makers and regulators to identify in a timely manner options to achieve those objectives.
- Develop summaries and reports on the results of the technical analysis for use in an open stakeholder process.
- Publish summaries and reports after considering the input received from the open process and provide the results of the Collaborative analysis to the regional planning processes for their consideration in modifying regional plans.
- Seek input from the SSC in the development of the two specific reports called for in the Funding Announcement.

10. Multiple Principal Investigators

For purposes of this FOA, there will be eight (8) PIs that represent the broad geographical areas that comprise the Eastern Interconnection. Each PI is listed below:

[11] To the extent the DOE awards Topic B funding to additional state entities, such as state utility consumer advocate agencies, the PIs would coordinate their activities with these entities as well.

A. Principal Investigator

1. PJM Interconnection, L.L.C. ("PJM")
2. New York Independent System Operator, Inc.("NYISO")
3. ISO New England, Inc.("ISO-NE")
4. Midwest Independent Transmission System Operator, Inc. ("MISO")
5. Southern Company Services Inc., as agent for Alabama Power Company, Georgia Power Company, Gulf Power Company, and Mississippi Power Company ("Southern")
6. Tennessee Valley Authority ("TVA")
7. Mid-Continent Area Power Pool, by and through its agent, MAPPCOR
8. Entergy Services, Inc. on behalf of the Entergy Corporation Utility Operating Companies ("Entergy")

PJM has been designated as the Lead Principal Investigator for this Funding Announcement. In addition, a Project Manager will be chosen to serve as the single point of contact for questions/concerns/ activities/issues/etc that arise from the Department in relation to this application and the Project process/work product.

PJM, through the Project Manager, will provide coordination and management of the Project among the PIs and manage the relationships with the EIPC Analysis Team participants and other subcontractors. The Coordination and Management Plan, which describes these relationships in more detail, is outlined below. The purpose of the Coordination and Management Plan is to summarize how the PIs, PAs, SSC and Collaborative work groups will interact and coordinate their work activities to meet the Project deliverables outlined in this proposal.

The Project Management Plan describes the means by which the Project Manager will coordinate all project activities among the PIs and subcontractors in order to fulfill the project objectives outlined in Section 14. As a matter of clarification, the Coordination and Management Plan is different than the Project Management Plan that is included as a separate document with this Application.

B. Coordination and Management Plan

The multiple PI project approach supports the collaborative efforts required to ensure a successful outcome, consistent with the Department's project objectives, regarding development of regional, interregional, and interconnection-level transmission analysis and planning. Each business entity identified below agrees to provide reasonable internal resources to support its designated PI and to work in good faith with all PIs to accomplish the tasks and deliverables identified in the proposed work scope. Each PI has the appropriate level of authority and responsibility required to perform and coordinate project management activities, including assistance with stakeholder outreach.

TITLE	BUSINESS ENTITY	DESIGNEE
Lead Principal Investigator	PJM	Chuck Liebold
Principal Investigator	Entergy	Joe Payne
Principal Investigator	ISO-NE	Steve Rourke
Principal Investigator	MISO	Jeff Webb
Principal Investigator	MAPPCOR	Daniel S. Fredrickson
Principal Investigator	NYISO	John P Buechler
Principal Investigator	Southern	Chuck Chakravarthi
Principal Investigator	TVA	David Till

The obligations of each PI and the obligations of the other PAs in the Eastern Interconnection relative to ensuring timely completion of the Project are set forth in the EIPC Agreement.

The following sections describe the processes to be used to manage and coordinate project technical issues relative to the performance of the proposed scope of work. These processes apply only to the work scope identified for each PI organization, pursuant to negotiation of a Cooperative Agreement with the Department.

Technical and Administrative Responsibilities

The multiple PI approach will contribute to the success of the Project since these PIs represent those PAs with responsibility for most of the Eastern Interconnection and who bring extensive experience and knowledge of the transmission infrastructure, NERC and local reliability criteria as well as economic planning to bear on the technical analysis.

The Lead PI will represent the Recipient, if selected for an award with the Department, and coordinate communication with the Department and the other PI participants. The Lead PI will be responsible for the following:

- Retaining and monitoring the work of the Project Manager to ensure the effective day-to-day project management in coordination with the other PIs and PAs.
- Negotiation and administration of sub-award agreements.
- Submittal of invoices to the Department and disbursement of funds to PIs, applicable PAs and other subcontractors; submittal of required technical and cost reports to the Department.

As evidenced by the EIPC Agreement and the Letters of Commitment, each participating PI organization is committed to providing the resources and finances required, as submitted in each organization's proposal, to ensure the success of the proposed Project. Each entity will manage its individual resources, deliverables, schedule and costs.

As a team, the Lead and other designated PIs will work together to accomplish the following, all in consultation with the SSC:

- Ensure that Project objectives and deliverables are met.
- Coordinate preparation of technical reports, analyses and studies.
- Review status of Project schedules and costs.
- Evaluate options and develop solutions necessary to resolve technical issues.
- Interface with the SSC and other stakeholders.

Communication Plan

The Project Manager, under contract to the Lead PI, will have primary responsibility for coordinating communication with the Department and the other PI participants. All technical correspondence directed to the Department will be submitted by the Lead PI through the Project Manager with copies to all PI and PA participants. All technical correspondence, excluding confidential contract issues specific to each business entity, shall include copies to all PI participants.

Additionally, the Project Manager will communicate with stakeholders regarding project status updates, technical analysis status, project milestones, upcoming events and other information related to the Project through the SSC, the Project website or other means (e.g. electronic mail, teleconferences, webinars).

Decision Process
The multiple PI approach is designed to ensure a collaborative team approach to project management. The decision process among the PIs will be governed by the Coordination Committee established in accordance with the provisions of the EIPC Agreement.

Conflict Resolution Process
The EIPC Agreement provides a specific process whereby the Participating Principal Investigators and Other Funded Parties (as those terms are defined in the EIPC Agreement[12]) have agreed to negotiate in good faith to resolve any disputes with regard to the work of the Analysis Team to support this proposal.

Publications
All publications or reports developed as part of the Project work scope shall be reviewed by the EIPC Analysis Team consistent with Section VI of the EIPC Agreement prior to submittal to the Department or any other agency/entity. The release of any such final publications shall be reviewed with the SSC whose advice, recommendations and input will be sought out.

Intellectual Property
Each PI and PA shall maintain, in a secure manner, the confidentiality of Confidential Information and/or CEII developed, prepared, or disclosed by each other PI or PA party in connection with the performance of the scope of work as outlined in the Cooperative Agreement with the Department and the EIPC Agreement. Any and all patent rights, other intellectual property, or rights in technical data developed pursuant to a Cooperative Agreement with the Department, as a result of an award related to the FOA, shall be treated in accordance with the terms and conditions set forth in such Cooperative Agreement and the EIPC Agreement.

11. Facilities and Other Resources

The Project will leverage the existing facilities of the EIPC Analysis Team, PIs and other Planning Authorities to perform basic transmission system modeling and analysis functions.

When group settings are necessary for transmission modeling and analysis activities, the Project will utilize the offices and computer modeling applications of the individual PIs and PAs in addition to the offices and modeling applications of CRA and ORNL. The addresses for these locations are included in the "Project/Performance Site Location" file included with this Application.

Although web conferencing and other electronic outreach tools will be utilized to reduce travel burdens, conference facilities will be required to host certain Project activities such as planning meetings and general business meetings, regional stakeholder workshops, SSC meetings and stakeholder workgroup meetings, and other events. Locations have not yet been determined, but are anticipated to rotate within the Eastern Interconnection region among economical and accessible venues to encourage broad stakeholder participation and reduce travel and cost burdens.

[12] Refer to the EIPC Analysis Team Agreement submitted as a separate "Optional Other Attachment" with this Application.

12. Equipment/Software Models

The Project will leverage the equipment and software utilized by the EIPC Analysis Team, PIs and other PAs in the normal course of regional planning. It is anticipated that industry standard software such as the following, will be employed in the technical analysis conducted for the Project:

- Processors and storage for production cost, power flow, and resource expansion analyses
- GE MAPS–MWFLOW – production cost simulation software
- PSS/E - Powerflow
- CRA NEEM – Resource expansion
- Energy Velocity and MapInfo – Mapping
- VSAT – Dynamics
- Short Circuit

Stakeholder webinars, webcasts and teleconferencing for SSC meetings, work group meetings and other Stakeholder meetings will be provided by The Keystone Center in their role of facilitating stakeholder participation.

13. Bibliography and References

Reference is made to the following websites that contain information relative to the Order 890 processes currently in place for each of the PIs. These websites contain information regarding the general Regional Planning process, communications with stakeholders and study reports prepared in connection with transmission planning studies requested by stakeholders.

Principal Investigator	Regional Planning Website
PJM (Lead)	http://www.pjm.com/planning.aspx
Entergy	http://oasis.e-terrasolutions.com/documents/ees/MSS/INFO.htm
ISO-NE	www.iso-ne.com/trans/index.html
MISO	http://www.midwestmarket.org/page/Planning
MAPPCOR	www.mapp.org
NYISO	http://www.nyiso.com/public/services/planning/reliability_assessments.jsp
Southern	http://www.southeastirpp.com/general_documents.asp
TVA	http://www.oatioasis.com/tva/tva_plan.htm

14. Statement of Project Objectives

A. OBJECTIVES

The objective of the Project is two-fold:

1. Establish processes for aggregating the modeling and regional transmission expansion plans of the entire Eastern Interconnection and perform interregional analyses to identify potential conflicts and opportunities between regions. This Interconnection-wide analysis will also serve as the reference case for modeling various alternative grid expansions based on the scenarios developed by stakeholders. The existing Regional Plans serve as an appropriate reference case because they:
    a. Are developed through processes that include both “bottom-up” and regional coordination processes intended to meet all current state, provincial, and federal

regulatory and reliability requirements including the integration of renewable, low carbon, and demand-side resources.

b. Represent extensive underlying analysis have been well vetted within each region, and have been determined by each PA to meet NERC reliability criteria**.**

c. Provide comprehensive expansion plans which are in progress toward implementation.

d. Can readily be adapted to implement opportunities to increase interregional compatibility or expansion efficiencies.

2. Perform scenario analysis as guided by broad stakeholder input and the consensus recommendations of the SSC to aid states and other stakeholders in assessing interregional options and policy decisions.

Phase I (To be completed prior to 6/30/2011)

- Aggregate modeling and integrate regional expansion plans. Provide interregional assessments of transmission system capabilities for the year 2020 in the planning horizon. Identify potential constraints and quantify the ability to move power between regions through reliability and economic analyses. Identify opportunities for potential transmission enhancements to regional expansion plans to increase the ability to move power or reduce costs and communicate to regional planning processes.
- Establish a multi-constituency SSC process for providing consensus guidance on scenario selections. Provide macroeconomic analysis and high-level transmission analysis to assist the SSC in the selection of scenarios for further analysis. Provide grid enhancement and resulting production cost analysis and assess the associated impacts of scenarios selected for the year 2020 in the planning horizon. Develop interregional expansion model(s) to include resource options of interest consistent with the guidance from each state and the SSC, and evaluate the options through reliability and economic analyses. Communicate results to states, provinces, other stakeholders, and regional planning processes**.**

Phase II (To be completed prior to 6/30/2013)

- Develop lessons learned from Phase I and refine Phase I analysis accordingly.
- Update aggregate modeling and integrate regional expansion plans. Provide interregional assessments of transmission system capabilities for the year 2022 in the planning horizon, subject to guidance from the multi-constituency SSC. Identify potential constraints and quantify the ability to move power between regions through reliability and economic analyses. Identify opportunities for potential transmission enhancements to regional expansion plans to increase the ability to move power or reduce costs and communicate to regional planning processes.
- Refine, augment, and narrow scenarios as determined by the SSC process for providing consensus guidance on scenario selections. Provide macroeconomic analysis and high-level transmission analysis to assess the associated impacts of scenarios selected for the year 2022 in the planning horizon, subject to guidance from the multi-constituency SSC. Develop interregional expansion model(s) to include resource options of interest consistent with the guidance from each state and the SSC, and evaluate through reliability and economic analyses. Communicate results to States, other stakeholders, and regional planning processes.
- Summarize alternative transmission expansion options incorporated into the 2013 expansion plans.

B. SCOPE OF WORK

The Project will build upon the extensive annual planning activities associated with the local and regional planning processes, the FERC 890 processes, and the existing interregional planning

processes. The Project will conduct a minimum of two sets of in person multi-constituency Stakeholder meetings for each phase, one to determine guidance for the analysis and one to convey the results of the analysis. The Project will supplement these meetings with conference calls and web meetings as needed. The Project will aggregate modeling and regional expansion plans developed in the annual regional processes for 2010, and will conduct base plan and scenario analysis for the 2020 planning year to identify potential impacts and interregional transmission expansion options. The Project will provide the initial results of the analysis at the second Stakeholder meeting(s), complete a formal commenting process with Stakeholders on the results and a draft report, and deliver a final report to the Department prior to 6/30/2011.

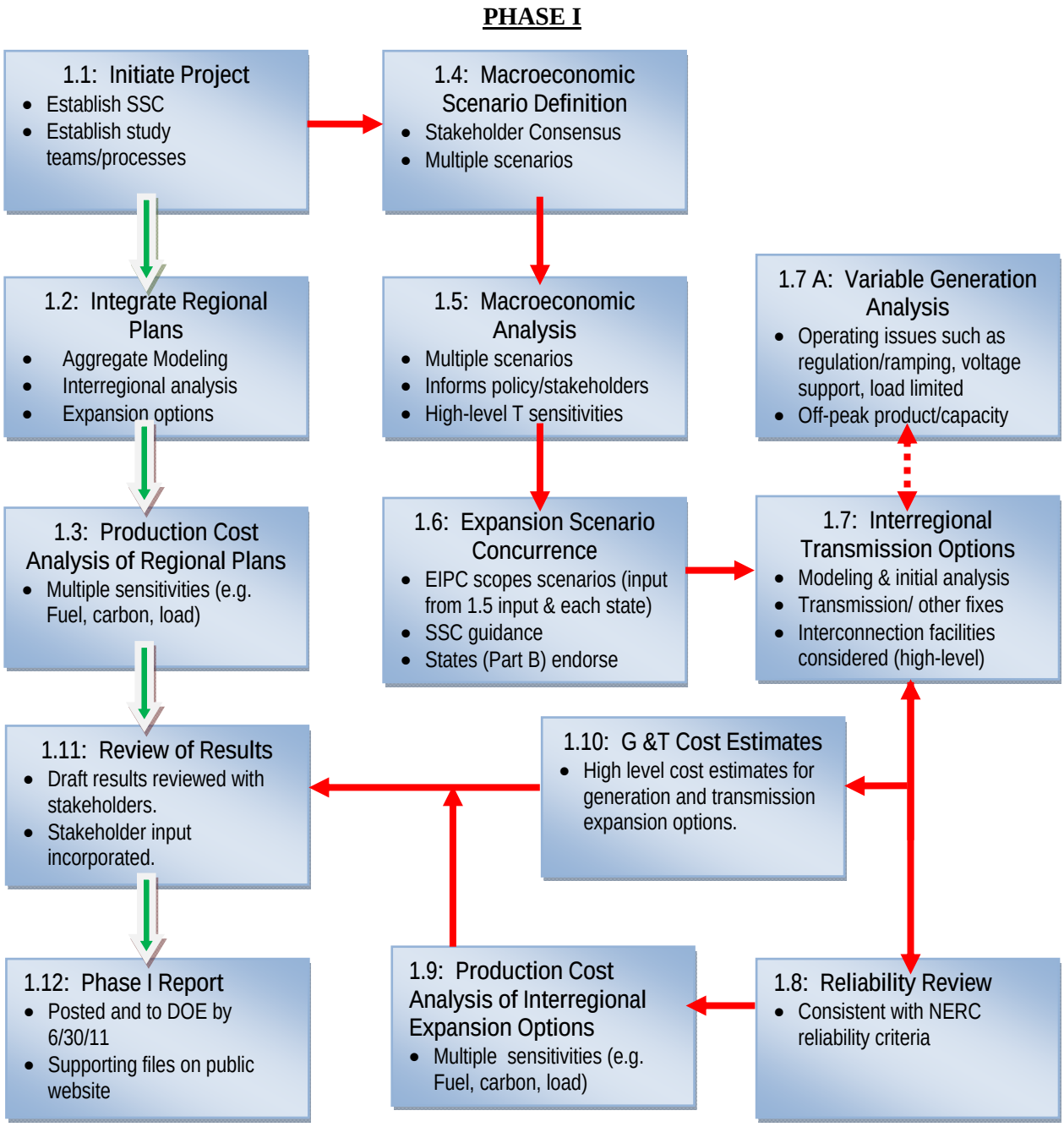
The final report for Phase I will include the results of the reliability and economic analyses performed on the aggregated modeling of the regional expansion plans for the Eastern Interconnection for the subject years, including potential expansion options identified through the interregional analysis. The report will provide the results of the macroeconomic scenario analysis for each scenario initially proposed by the SSC including high level transmissions sensitivities. The report will provide the results of the reliability and economic analyses performed for the resource expansion scenario(s) selected for further study including the interregional transmission expansion options identified and the associated cost estimates**.**

The Project will facilitate meetings with the associated regional planning entities to provide this input for use in their subsequent planning processes. The Project will provide a website to make public analysis results, modeling, work papers, and other materials, subject to applicable regulations associated with protection of Critical Energy Infrastructure Information (CEII) and Confidential Data.

In Phase II, the above scope of work will be performed again in conjunction with the annual Collaborative processes for 2012 and a final report will be provided to the Department prior to 6/30/2013. In addition to the 2011 deliverables, the Project will provide a review of expansion options which were incorporated into 2013 regional expansion plans based upon the 2011 findings.

C. TASKS TO BE PERFORMED

Figure 3: Task Relationships



PHASE I (1/4/10 to 6/30/11)

Task 1.0 Project Management and Planning

Key Inputs: Contract award details under the FOA
Key Deliverables: Revised Project Management Plan

As the first task to be completed, the Project Management Office (PMO) will revise the Project Management Plan (PMP) to include details from the final contract award. The PMP describes the general approach used to manage the Project and provides an overview of the project management tools and techniques to be utilized throughout the Project. The approach, tools, and techniques will be revised as necessary along with the Project timeline and milestones.

The PMO will also revise the PMP periodically throughout the Project as needed to reflect the results from work completed and the changes necessary to accomplish all Project objectives in accordance with Project delivery dates. Quarterly reporting on schedule progress, actual expenditures versus budget, and revised expenditure projections will be reflected in the PMP updates.

Task 1.1 Initiate Project

Key Inputs: Contract award details under the final Funding Announcement Agreement.
Key Deliverables: Stakeholder meetings and establishment of the SSC. Establishment of working groups.

The PIs will review their award under Topic A and will meet with the Topic B awardees to assess potential adjustments needed in the process for selecting the SSC or study team structures. The PIs and other PAs participating in the Collaborative processes[13] will update or establish study processes as required consistent with the award under Topic A.

The Keystone Center will facilitate the formation of the SSC, a Stakeholder Working Group (SWG) and any necessary subgroups. The SWG will be responsible for facilitating the interchange of information between the broader stakeholder community and the SSC.

The PIs, with the Keystone Center providing facilitation services, will conduct a series of regional stakeholder meetings to timely 1) communicate the Project's structure, processes, and deliverables, 2) work toward the establishment of the SSC and selection of representatives from multiple constituencies, and 3) initiate work toward consensus on scenarios for analysis. Throughout the Project, the Collaborative will supplement in-person stakeholder events with webinars and conference calls to facilitate timely input from the broader stakeholder community and the SSC regarding Project tasks.

Task 1.2 Integrate Regional Plans

Key Inputs: Regional Plans and modeling, NERC MMWG modeling
Key Deliverables: Interregional modeling (reference cases), Interregional analysis, and Transmission Expansion options
The PIs, building upon the regional plans of the NERC PAs, will aggregate and update the modeling[14] required to perform interregional analysis for the entire Eastern Interconnection. This

[13] Principal Investigators, as used in the following task descriptions, also includes the work contributions of the other Planning Authorities in the Collaborative.
[14] The Collaborative will build from the most recent NERC MMWG modeling.

modeling will serve as the basis (reference cases) both for the interregional analysis of the Regional Plans and for the expansion scenario analysis selected by Stakeholders through the SSC. Interregional analyses will include contingency analysis, transfer analysis, and other reliability assessments performed on an interregional basis to identify potential conflicts among regional plans and opportunities for efficiencies in transmission expansion.

This integration and interregional analysis will assess compatibility among the regional plans, which are developed to meet all current state, provincial, and federal regulatory and reliability requirements, and will identify potential opportunities to enhance the regional plans across regions**.**

Task 1.3 Production Cost Analysis of Regional Plans

Key Inputs: Interregional modeling from Task 1.2
Key Deliverables: Production cost analysis
Economic analysis of the integrated regional plans will be performed using production cost modeling. Production cost analysis will assess all 8760 hours of the future year (2020) and will forecast energy production costs, constraints limiting dispatch and interregional transactions, anticipated emissions, renewable energy production, and other pertinent factors. The production cost analysis will be performed for multiple future sensitivities such as high/low loads, high/low fuel costs, high/low carbon taxes, or similar parameters.

The economic analysis will be performed by CRA using GE MAPS, a security-constrained production cost analysis model that simulates the hour-by-hour operation of the transmission and generation system in the Eastern Interconnection, incorporating transmission, reliability, and environmental constraints. The analysis will quantify economic and environmental impacts under multiple sensitivities including changes in costs, prices, emissions, and reliability. The CRA model uses a highly-detailed database of generation and transmission facilities in the Eastern Interconnection, which will be refined using input from Collaborative members and stakeholders.

Task 1.4 Macroeconomic Scenario Definition

Key Inputs: SSC established in Task 1.1, Stakeholder input from Task 1.1
Key Deliverables: Consensus from SSC on Macroeconomic scenarios
The PIs, with the Keystone Center providing facilitation services, will conduct meetings to generate strategic guidance from the multi-constituency SSC toward developing a set of macroeconomic scenarios which will be analyzed and compared. While principal responsibility for reaching consensus on these scenarios will rest with the SSC, the PIs will assist and inform the SSC and the SWG in their task. The SSC and SWG are responsible for gathering and synthesizing input from the broader stakeholder community on inputs and implications of the Macroeconomic Analysis and other phases of the analysis. The Project proposal provides resources to facilitate the on-going interchange between the SSC, SWG and the broader stakeholder community.

The Macroeconomic Scenarios are intended to provide stakeholders and policy makers a forecast of how the interconnected electrical system might evolve for a range of potential policy and economic futures. For example, a set of Macroeconomic scenarios selected by the SSC might be a 20% Renewable Energy Standard (RES) under high, medium, and low fuel costs. Another set might be a 20% RES with $30 carbon allowances under high, medium, and low fuel costs. Such analysis will show potential renewable resource development, impacts on loads, emissions reductions, energy exchanges between regions, and other metrics of interest. Given the fixed timeframe and resources of the project, the intent is to define a representative set of potential paths for further analysis to provide useful information to policymakers and stakeholders.

Task 1.5 Macroeconomic Analysis

Key Inputs: SSC consensus from Task 1.4.
Key Deliverables: Macroeconomic results, High-level Transmission analysis
The Collaborative will provide macroeconomic analyses to provide a high-level assessment of the outcomes of numerous proposed scenarios developed by the multi-constituency SSC. To help inform their decisions, stakeholders and policy makers will receive high level results such as economies of resources in various regions, impacts on renewable development, impacts on emissions, impacts on economic development and demand, and other factors.

The macroeconomic analysis will be performed by CRA using "NEEM", a model which considers impacts both to the electric power supply and to the other sectors of the US economy. Because the macroeconomic approach accounts for all sectors of the economy and not just electric power, it also conveys potential impacts on electric demand and prices that may result related to energy policy impacts in other areas of the economy.

The Principal Investigators will also provide high-level transmission analysis for the scenarios of interest as indicated by the SSC. This analysis would not be detailed power flow analysis, but rather conceptual assessments made by Planning Authority engineers of potential interregional transmission expansion to support the magnitude of interregional energy exchanges identified in the macroeconomic analysis scenarios.

Task 1.6 Expansion Scenario Concurrence

Key Inputs: Macroeconomic analysis and high-level transmission analysis results from Task 1.5, Individual State and LSE resource guidance, SSC input from Tasks 1.4 and 1.5.
Key Deliverables: Expansion Scenario(s), Transmission Analysis Study Scopes for Expansion Scenario(s)

The macroeconomic analysis of Task 1.5 provides stakeholders information regarding potential resources in other regions and associated interregional energy exchanges that may be desirable under certain policy or economic futures. The focus of Task 1.6 is to develop Expansion Scenarios of interest which provide a platform for states and other stakeholders to consider higher levels of energy exchange between regions than may be included in Regional Plans. The Principal Investigators will develop proposed scope documents for the Expansion Scenario(s) based upon the input received from the SSC during development and review of the microeconomic analyses in Tasks 1.4 and 1.5. The PIs will incorporate state inputs[15] in developing the level of external resources (imports) to be assessed for each area and/or the level of resources sited within each area to be assessed for exports to other areas. The Principal Investigators will review the proposed scope documents with the SSC to receive strategic guidance and adjust the scopes as appropriate. The Principal Investigators will provide finalized scope documents for each scenario to the Topic B State body for endorsement. The endorsed scope documents will provide the basis for the interregional expansion options to be considered in Task 1.7.

Task 1.7 Interregional Transmission Options

Key Inputs: Transmission Analysis Study Scopes for Expansion Scenario(s) from Task 1.6, Reference Cases from Task 1.2.

[15] State input is anticipated to be provided by state authorities consistent with state processes for making resource selections. It is intended that one state or region should not be able to impose resource assumptions on another state or region in developing the scope outside of a consensus among the states.

Key Deliverables: Interregional Expansion Options and associated modeling, Preliminary Results Webinars

In Task 1.7, the PIs will modify the reference power flow cases developed in Task 1.2 to build interregional expansion models. Task 1.7 will then focus on transmission reinforcements to support the interregional energy exchanges for each of the expansion scenario(s) The PIs will develop transmission expansion options focused on the EHV transmission network (230 kV and above), but will also consider operating options and other potential solutions. The PIs will consider the transmission facilities required to integrate new resources within a region using a similar, high voltage focus, but will not attempt to resolve potential local transmission issues. The PIs will leverage the expertise of the Collaborative's membership and ORNL in considering High-voltage direct current (HVDC) and advanced technologies in developing expansion options.

The output of Task 1.7 will include transmission expansion options identified for each scenario and the associated solved power flow cases necessary to perform reliability and economic analyses. The transmission expansion options will also receive high level cost estimates in Task 1.10. The Project is intended to provide high-level interconnection-wide analysis and not substitute for regional planning processes or state, local or provincial siting processes. The Project will not identify specific routing, siting, environmental or other related issues associated with any potential enhancements to the grid coming out of this task.

The Collaborative, with the Keystone Center providing coordination and facilitation services, will conduct webinars to review preliminary results and solicit input from the SSC and Stakeholders.

Task 1.7 A Variable Generation Analysis

Key Inputs: Transmission Analysis Study Scopes for Expansion Scenario(s) from Task 1.6, Reference Cases from Task 1.2
Key Deliverables: Reliability constraints associated with operating variable generation. The PIs will work with ORNL to develop and perform appropriate analysis to assess reliability constraints associated with operating significant amounts of variable generation. Such analysis would consider reliability issues related to ramp rates and regulation, off-peak power production limitations, operating reserves, reactive support, and other operating concerns. To the extent constraints are identified, they will be reflected in the expansion options developed in Task 1.7.

Task 1.8 Reliability Review

Key Inputs: Interregional Expansion modeling from Task 1.7
Key Deliverables: Reliability assessments of Interregional Expansion Options
The PIs will perform reliability analyses consistent with NERC reliability criteria for transmission planning to assess in aggregate for the Eastern Interconnection the interregional transmission options developed in Task 1.7. The Collaborative intends to engage the computational and technical capabilities of the ORNL to expedite this analysis. To the extent reliability issues are identified, these scenarios may be referred back to Task 1.7 for further review.

Task 1.9 Production Cost Analysis Interregional Expansion Options

Key Inputs: Interregional Expansion modeling from Task 1.7, Flowgates identified during Task 1.8 analysis
Key Deliverables: Production cost analysis
Economic analysis will be performed using production cost modeling for each scenario based upon the power flow modeling and transmission expansion options developed in Task 1.7. Consistent with Task 1.3, production cost analysis will assess all 8760 hours of the future year (2020) and will forecast energy production costs, constraints limiting dispatch and interregional

transactions, anticipated emissions, renewable energy production, and other pertinent factors. The production cost analysis will be performed for multiple future sensitivities such as high/low fuel costs, high/low carbon taxes, and similar parameters.

As in Task 1.3, the economic analysis will be performed by Charles River Associates (CRA) using GE MAPS.

Task 1.10 Generation and Transmission Costs

Key Inputs: Interregional expansion options (G&T) from Tasks 1.6 & 1.7, High level, generic cost information

Key Deliverables: High Level cost estimates for expansion option facilities

Task 1.10 will provide high-level estimates of the capital costs of the interregional generation resource and transmission expansion options considered. Transmission costs will be developed by the PIs using generic planning-type estimates[16] referenced to the study year (2020) and will represent "overnight" costs[17].

Costs associated with resource additions and retirements will be developed by CRA (which will be informed by stakeholder assumptions regarding technology characteristics and costs).

Task 1.11 Review of Results

Key Inputs: Results from tasks 1.1 through 1.10.

Key Deliverables: Report review workshops with stakeholders, Draft report, SSC input on draft report. A draft Phase I report will be developed by the PIs and posted for SSC and stakeholder review prior to the regional stakeholder workshop(s). The report will include the following[18]:

	Regional Plans	Interregional Options
Aggregated modeling of the existing Regional Plans	X	
Interregional Reliability Assessments for the Eastern Interconnection	X	X
Economic (production cost) analysis for multiple future sensitivities	X	X
Macroeconomic Analysis for multiple future expansion scenarios		X
Transmission expansion options and other potential solutions	X	X
Cost estimates for expansion options	X	X

The Collaborative, with the Keystone Center providing facilitation services, will conduct regional stakeholder workshop(s) to present the results of the analysis, respond to questions, and solicit input from stakeholders. The SSC, taking into consideration the input from the Workshops and other stakeholder venues, will provide consensus-based comments on the draft report.

Task 1.12 Phase I Report

Key Inputs: Draft report and Stakeholder input from Task 1.11.

Key Deliverables: Final report and work papers

[16] For example, generic $ per mile for transmission lines rather than detailed ROW routing and engineering cost estimates.

[17] "Overnight" assumes the facilities could be built and placed in service in a given year. "Overnight" costs do not include significant financing costs for construction work in progress.

[18] Subject to legal and regulatory requirements for Critical Energy Infrastructure Information (CEII) and treatment of Confidential Information.

The PIs, with CRA and ORNL providing technical support, will review the input received from the SSC and address it in the final Phase I report. The Phase I Report will be submitted to the Department on or before June 30, 2011.

In addition to the final report, associated modeling, databases, and other work products will be made available electronically during the Project through a Project Website[19].

PHASE II (7/1/11 to 6/30/13)

Phases I and II are broadly similar. Phase I will focus on the 2020 planning year and establishing group structures, methodology development, scenario development, interregional analysis of the regional plans, and scenario analysis.

Phase II will focus on the 2022 planning year utilizing the then current regional plans and models, which will have been updated to meet prevailing regulations and reliability requirements. Phase II will include enhancements incorporated into regional plans since Phase I including those options identified during Phase I that may have been adopted during regional planning activities. The SSC and stakeholders will determine which scenarios from Phase I should be refined in more detail and which new scenarios are of interest.

The Tasks for Phase II are largely the same as Phase I, except as noted below.

Task 2.1 Review Phase I Results
The PIs will conduct a formal "lessons learned" analysis to review the analysis performed in Phase I, how it could be improved, and where it could be modified.

Task 2.2 Integrate Regional Plans
The focus is on the latest modeling and regional plans for 2022.

Task 2.3 Production Cost Analysis of Regional Plans

Task 2.4 Macroeconomic Scenario Definition

Task 2.5 Macroeconomic Analysis

Task 2.6 Expansion Scenario Concurrence

Task 2.7 Interregional Transmission Options Development

Task 2.7 A Optional analyses provided by ORNL per the Department approval

Task 2.8 Reliability Review

Task 2.9 Production Cost Analysis of Interregional Expansion Options

Task 2.10 Generation and Transmission Costs

Task 2.11 Review of Results

Task 2.12 Phase II Report
The Phase II report would also include a review of those Phase I expansion options which have been incorporated into regional plans. The Phase II Report will be submitted to the Department on or before June 30, 2013

[19] Ibid.