

**Revised Statement of Project Objectives**

**Eastern Interconnection Transmission Analysis**

\*\*\*\*\*

**Application for Financial Assistance Under  
Funding Opportunity Number: DE-FOA0000068**

**Topic A**

**Interconnection-Level Analysis and Planning for the  
Eastern Interconnection**

**February 16, 2010**

\*\*\*\*\*

## **1. Summary of Revised Statement**

Pursuant to the application (titled The Eastern Interconnection Transmission Analysis Project (the “Project”)) submitted by PJM Interconnection, LLC in response to the U. S. Department of Energy (the “Department”) Funding Opportunity Number DE-FOA 0000068 (“FOA”), the Principal Investigators for the Project hereby submit the following revisions to the Statement of Project Objectives (“SOPO”) included in the initial application.

As described in the following sections, the SOPO has been revised to provide additional time for the formation of the Stakeholder Steering Committee (“SSC”), to allow adequate time for the SSC to evaluate and assess the results of the Macroeconomic sensitivities for concurrence on the Expansion Scenarios to be developed, to better align with the task schedule of the Topic B Awardees (EISPC) and to address the transition of the Project once the Department’s funding has ended.

In particular, the work identified in Tasks 1.1 through 1. 6 (now Tasks 1 through 6) of the original application will be performed and a report submitted to the Department by June, 2011. The scope of work identified in Tasks 1.7 through 1.12 (now identified as Tasks 7 through 12 and with Task 1.7A – Variable Generation Analysis excluded) will be performed for up to three Expansion Scenarios and included in a final report in June, 2012. Additional Sub-Task detail has been added to the descriptions in this revised proposal in order to better describe the work and what will be achieved in each Task. The second phase of work identified in the original application has been eliminated and the Eastern Interconnection Planning Collaborative (EIPC) is discussing plans to develop the analysis capability, stakeholder processes and project management structure to perform transmission analysis for the Eastern Interconnection on a self funded basis once the Department’s funding is no longer available.

## **2. Project Value**

The Project will provide value and benefits beyond existing transmission study processes in a number of ways. The Project represents a first-of-its-kind effort, to involve Planning Authorities 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 coordination and collaboration envisioned among the Topic A and B Awardees for the Eastern Interconnection under the FOA provides considerable added value and is also a “first of its kind” Interconnection-wide effort among the Eastern States to collaborate on resource expansion options and transmission planning analysis. EIPC and EISPC working together in close coordination will provide an Interconnection-wide forum and platform for those efforts across the East that has not previously existed. This coordination will further credibility among all stakeholders and help promote acceptance and support of the results of the analyses. Following the completion of the Project, the Principal Investigators together with the additional members of the EIPC will have established the foundation for a continuing process of expansion scenario analyses to inform energy policy decisions.

The basic approach for the Project 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. The interregional and scenario analyses to be conducted under the Project 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. This interconnection-wide analysis of the regional plans has not been previously performed and should identify greater opportunities for efficiencies.

The Project will build upon, rather than substitute for, the current local and regional transmission planning processes developed by the Planning Authorities 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 Planning Authorities to meet the NERC Reliability Criteria<sup>1</sup>. Although coordination has long existed in the Eastern Interconnection, the potential integration of large amounts of renewable resources offers greater 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.

The Project will utilize an open and transparent multi-constituency stakeholder process for the entire Eastern Interconnection (which does not currently exist) to identify specific resource expansion scenarios to be studied including the identification of potential transmission infrastructure enhancements to address those scenarios. 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. Further, the resource expansion scenarios may consider development for 15 or 20 years into the future which is well beyond the existing regional planning horizons. While these scenarios are understandably more speculative, they will provide value in better understanding the long term implications of various policy alternatives.

The analysis will include reliability evaluations consistent with the numerous requirements of the NERC and regional reliability standards. The Principal Investigators 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 processes (resource expansion scenarios, transmission enhancements and reliability analysis) will provide policy makers and stakeholders with quality and technically sound information, developed by those entities with the responsibility to plan and operate the transmission grid, concerning the cost and reliability impacts of the identified scenarios.

---

<sup>1</sup> Reference 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.

### **3. 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 a 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 Planning Authority 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 federal, state and provincial regulators, other policy makers and other stakeholders in assessing interregional options and policy decisions.

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

- Establish a multi-constituency SSC process for providing consensus guidance on the development and selection of the scenarios, input on the modeling assumptions and review of the results.
- 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 those opportunities to regional planning processes.
- Provide Macroeconomic analysis and high-level transmission analysis for up to eight different futures (with up to nine sensitivities performed for each future) to assist the SSC in the selection of scenarios for further analysis. The selection of different futures to be considered in the Macroeconomic analysis will be determined by the SSC and may extend for 15 or 20 years into the future. Since, as described below, the State representatives will make-up at least one-third of the SSC, it may be reasonable and appropriate to allow the States to select a certain number (e.g. four) of the eight futures for the Macroeconomic analysis.
- Communicate results to States, other stakeholders, and regional planning processes.

- Result in the selection of up to three expansion scenarios for more detailed transmission analysis during Part II.

#### Part II (To be completed prior to 6/30/2012)

- Develop lessons learned from Part I and refine Part I analysis accordingly.
- Provide grid enhancement and resulting production cost analysis and assess the associated impacts of up to three future resource expansion scenarios selected by the SSC for the year 2020 or beyond in the planning horizon. These expansion scenarios may extend beyond the 10 year planning horizon of the current Regional Plans. 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. 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 to support the expansion scenarios identified during Part I.
- In its initial application, the Project included a “Variable Generation Analysis” that was intended to address certain operating issues associated with variable generation sources (e.g. wind generation) such as regulation/ramping, voltage support, load limiting operation and alternative transmission service products (e.g. off-peak firm service). That analysis has been eliminated from the Project; however, the Principal Investigators urge the Department to consider that work as part of a separate bid for support analysis from the National Laboratories. The Principal Investigators wish to actively participate in that work and will provide technical support for such analysis.

#### 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 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 to stakeholders and the SSC, complete a formal commenting process with stakeholders on the results and a draft report, and deliver an interim report to the Department prior to 6/30/2011. The resulting Eastern interconnection transmission model that is developed by integrating the regional plans and that has been analyzed to identify opportunities for potential transmission enhancements to regional expansion plans to increase the ability to move power or reduce costs, will be made available to the public.

The report for Part 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. The report will also provide the results of the Macroeconomic scenario analysis for each scenario initially proposed by the SSC including high level transmission sensitivities.

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 CEII and Confidential Data.

In Part II, the scope of work 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. A final report will be provided to the Department prior to 6/30/2012.

### C. STAKEHOLDER PARTICIPATION

The Project includes broad stakeholder input. The SSC will be formed to provide strategic guidance on the development of the scenarios, input on the modeling assumptions and review of the results. The SSC will be no larger than 30 members and will include representatives of key sectors/interest groups, including transmission owners and operators, generation owners and developers, renewable energy owners and developers, end users, non-governmental entities (NGOs), states, Canadian provinces, and other suppliers. Members of the SSC will be selected by each designated sector based on criteria established by The Keystone Center and the Principal Investigators based upon stakeholder input.

The Keystone Center has been gathering input from stakeholders across the Eastern Interconnect on how to formulate and select the SSC. The Project calls for sharing a proposal with all stakeholders in late February. In early March, the Principal Investigators will make a final decision on the number of seats for each sector on the SSC and the process that will be followed for selecting the members based on input received from the stakeholders. The process must be open to all interested individuals and transparent to all stakeholders. The EISPC will select the state representatives on the SSC. At least one-third of the seats are reserved for state representatives.

The revised Budget information for the Project continues to include details on funding for travel and other miscellaneous expenses for NGO and consumer advocate participation. The specific funding details for each group regarding number of participants and estimated travel expenses for each meeting are noted in the revised Budget forms. These two classes of stakeholders (along with Native American tribes and any other stakeholder class) are entitled to participate in the process in the same manner as all other stakeholders.

All SSC meetings will be open to all interested stakeholders via webcast and in-person venues. The specific funding details for stakeholder meetings are included in the Budget forms. The SSC will be supported by Stakeholder Working Groups (“SWG”) who will facilitate communication between the SSC, the Principal Investigators, and the broader interest groups. In addition, Regional Stakeholder Workshops will be held throughout the Eastern Interconnection each year to allow further stakeholder outreach and general public forums.

To keep stakeholders informed about the ways they can participate, the EIPC has created a website and listserve. The listserve will be used to send email notifications to all interested

individuals of upcoming events, outcomes from SSC meetings, links for access to posted documents and webcast meetings and webinars. The EIPC will also maintain an electronic collaborative workspace for the SSC, SWG and the interested public to post comments on documents and participate in electronic, facilitated forums on designated topics. All notices of meetings, agendas, information on how to access webinars, webcasts and audio conferencing will be posted on the EIPC website. Finally, the EIPC will keep the public informed by outreach through presentations at academic and other relevant conferences on the progress of the project.

#### D. PARTICIPATION BY THE TENNESSEE VALLEY AUTHORITY (TVA)

In its original application, the Principal Investigators identified certain contractors to participate and provide technical support for the analysis in several areas. In this revised Statement of Project Objectives, the Principal Investigators have eliminated one contractor and assigned the responsibility for certain Project work related to model development, reliability analyses and computing resources to TVA. In addition to its participation as a Principal Investigator, TVA will also provide supporting services to the Principal Investigators for this project as described below. These supporting services include:

- Coordination of integrated regional power flow models for reliability analysis,
- Grid analyses and dynamic studies, and
- Provision of secure resources for information exchange and data storage: A data storage center will be established that allows participants to share files, documents, calendar information, tasks, and associated communications. TVA will coordinate implementation of security agreements agreed to by the Principal Investigators. Controls will be established for distribution of Critical Energy Infrastructure Information. A public website will be created that allows approved information to be shared with the public.

Sub-Task 7 (c) - Coordination of integrated regional power flow models for reliability analyses: Using industry-standard software, TVA will coordinate an interregional transmission power flow model for the reference base case and up to three scenarios.

This task will require interaction with the Principal Investigators for model updating and problem resolution. It is expected that a mechanism similar to other interregional study model working groups will be used in this aspect of the data gathering, as well as for the load flow and dynamics studies described below.

Sub-Task 8 (a) - Perform multiple Eastern Interconnection-wide analyses: Using dedicated computer facilities at TVA and industry-standard software (e.g. PSS®E, PSS®MUST, PROMOD), TVA will perform multiple analyses of potential base case and scenario options covering the entire Eastern Interconnection. For this task, TVA will review the interregional transmission plans developed by the Principal Investigators for each of the scenarios and identify constraints that arise, in line with NERC reliability criteria.

Sub-Task 8 (a) - Grid analyses and dynamic studies: TVA will conduct various analyses regarding the dynamics and stability of the grid. These analyses address different topics

that can have a major impact on the transmission system's ability to meet the generation and loads as defined in the scenarios.

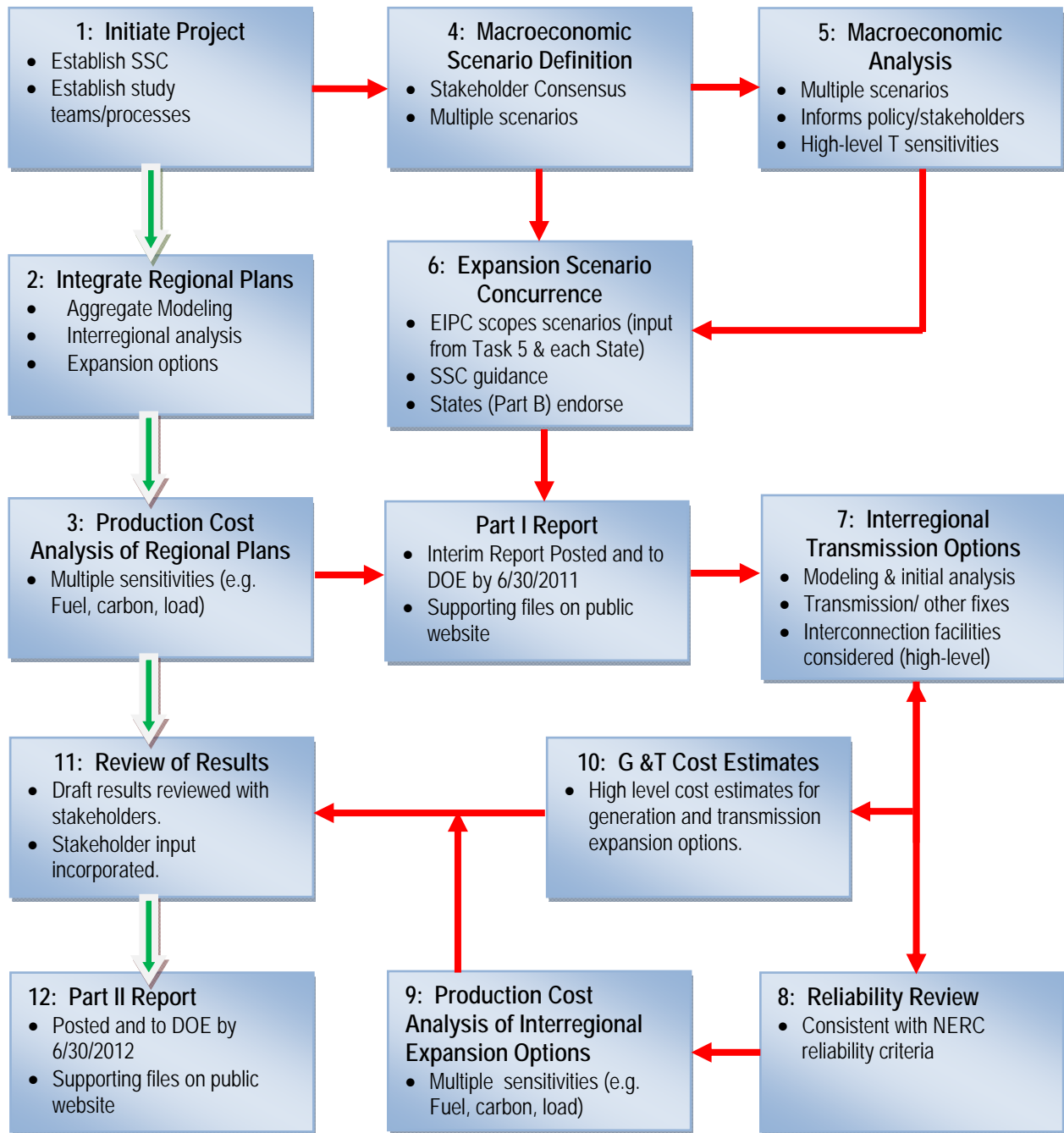
TVA will consider short-term use of an appropriate subcontractor with high skills and experience, such as PowerTech Labs, to speed initial work and help augment established skills for the future. TVA will also evaluate possibilities for augmenting computing resources for future work, such as the SIM computing center at the University of Tennessee, Chattanooga.

**E. INFORMATION ACCESS:**

Information required to produce the deliverables associated with this project will be treated in accordance with the Openness and Transparency principles of FERC Order No. 890. Therefore, information deemed to be confidential (both CEII and non-CEII) shall be handled in accordance with the Planning Authorities' applicable tariffs or other procedural requirements. Confidential information will be made available to parties, subject to the appropriate confidential treatment, through mediums such as but not limited to meetings, webinars and the EIPC Website. Non-confidential information shall be provided without restrictions through mediums such as but not limited to email, meetings, webinars and the EIPC website.



## F. TASKS TO BE PERFORMED



Part I (Project Initiation through June 30, 2011): Part I will focus on the 2020 planning year and establishing group structures, methodology development, Macroeconomic sensitivity development and interregional analysis of the regional plans.

***Task 0 Project Management and Planning***

Key Inputs: Contract award details under the Funding Announcement

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 and revised project schedule and milestone dates. 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 Initiate Project***

Sub-Task Summary: a) Adjust structure of SSC as needed based upon the award under the DOE FOA Part B, b) Commission SSC, c) Selection of SSC members, d) Establish SSC By-Laws; elect Chair, vice-Chair, etc. and e) Project Development (detailed scoping)

Key Inputs: Contract award details under the final Funding Announcement Agreement

Key Deliverables: Stakeholder meetings, SSC By-Laws and establishment of the SSC, Establishment of stakeholder working groups

The Principal Investigators will review their award under Part A and will meet with the Part B awardees to assess potential adjustments needed in the process for selecting the SSC or study team structures. The Principal Investigators and other Planning Authorities participating in the processes<sup>2</sup> will update or establish study processes as required consistent with the award under Part A.

The Keystone Center will facilitate the formation of the SSC, SWG and any necessary subgroups. The SWG will be responsible for facilitating the interchange of information between the broader stakeholder community, the SSC and the Analysis Team.

---

<sup>2</sup> Principal Investigators, as used in the following task descriptions, also includes the work contributions of the other Planning Authorities in the EIPC. In particular, the original proposal called for funding of 7 Planning Authorities to assist the Principal Investigators on the Project. That funding has been removed in this revised proposal and accompanying revised budgets, but those 7 Planning Authorities will still participate with the other Planning Authorities in the EIPC on this Project.

The Principal Investigators, 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 Principal Investigators 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 2 Integrate Regional Plans***

Sub-Task Summary: a) Develop study guide for documenting interregional analysis processes that refine the MMWG Modeling and regional plans as needed for Base Case Eastern Interconnection analysis, b) Conduct interregional transmission analyses for Base Case and identify potential transmission conflicts/opportunities among regional plans ("gap analysis"), c) Develop transmission options to address reliability impacts associated with potential conflicts among regional plans, d) Document and Communicate results for consideration in regional planning activities; post analysis on EIPC website and e) Develop flowgates

Key Inputs: Regional Plans and MMWG modeling

Key Deliverables: Interregional modeling (reference case for 2020), Interregional analysis, and Transmission Expansion options

The Principal Investigators, building upon the regional plans of the NERC Planning Authorities, will aggregate and update the modeling<sup>3</sup> required to perform interregional analysis for the entire Eastern Interconnection. This modeling will serve as the basis (reference case) 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 3 Production Cost Analysis of Regional Plans***

Sub-Task Summary: a) Perform production Cost Modeling for Base Case for 2020 and b) Document and Communicate results of Production Cost Modeling; Post analysis on EIPC website

Key Inputs: Interregional modeling from Task 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

---

<sup>3</sup> The Project will build from the most recent MMWG modeling.

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 production cost analysis will be performed by Charles River Associates (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 considerations. 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 EIPC members and stakeholders.

#### ***Task 4            Macroeconomic Futures Definition***

Sub-Task Summary: a) Initial Definitions Complete and b) Coordinate and Conduct Initial Stakeholder regional meeting(s) to develop consensus on resource expansion scenarios.

Key Inputs: SSC established in Task 1, Stakeholder input from Task 1

Key Deliverables: Consensus from SSC on Macroeconomic scenarios

The Principal Investigators, 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 Sensitivities which will be analyzed and compared. The Macroeconomic Analysis will be conducted for up to eight different futures (with up to nine sensitivities performed for each future). The selection of different futures to be considered in the Macroeconomic Analysis will be determined by the SSC (which includes the State representatives) and may extend for 15 or 20 years into the future. The State representatives will have the opportunity to select a certain number (e.g. four) of the eight futures for the Macroeconomic Analysis.

While principal responsibility for reaching consensus on these sensitivities will rest with the SSC, the Principal Investigators 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 Principal Investigators will determine the modeling tools and analysis methods for performing the work in connection with the Macroeconomic Analysis.

As a part of Task 2, the Principal Investigators will document the inputs and assumptions (fuel, carbon, load, land, water and other environmental metrics) that are included in the Integration Analysis of the current Regional Plans. For the Macroeconomic Futures, the Principal Investigators will coordinate with the Part B Project Manager and the SSC to identify and develop the various inputs needed to perform the Macroeconomic Analysis and other modeling assumptions.

The Macroeconomic Sensitivities 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 Sensitivities 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 5            Macroeconomic Analysis***

Sub-Task Summary: a) Coordinate and Conduct Second Stakeholder meeting(s) to finalize consensus on resource expansion scenarios; Identify scenarios for high-level analysis, b) Conduct Macro Analysis - Economics & High level transmission sensitivities, c) Review analysis results with Stakeholders and d) Conference calls and steering committee interaction

Key Inputs: SSC consensus from Task 4

Key Deliverables: Macroeconomic results for Resource Expansion Futures, High-level Transmission analysis

The Principal Investigators will provide Macroeconomic Analyses (for up to eight futures with up to nine sensitivities for each future) to provide a high-level assessment of the outcomes of numerous proposed scenarios to be determined by the SSC at the start of Part II. To help inform their decisions, stakeholders and policy makers will receive high level results such as economics 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 sensitivities 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 sensitivities.

### ***Task 6            Expansion Scenario Concurrence***

Sub-Task 6a Summary (Expansion Scenario Concurrence): a) Principal Investigators scope scenarios from Task 5 input, b) Review with SSC and solicit guidance, c) State endorsement, d) Document and Post scope of resource expansion scenarios of interest and e) Site new power flow resources per scenario

Sub-Task 6b Summary (Interim Report: Reference Case and Expansion Scenarios): a) Review CRA results/report and develop first draft summaries and b) Prepare Reference information, consensus scenarios, majority/minority input and prepare/post Interim Report

Key Inputs: Macroeconomic analysis and high-level transmission analysis results from Task 5, Individual State and LSE resource guidance, SSC input from Tasks 4 and 5.

Key Deliverables: Expansion Scenario(s), Transmission Analysis Study Scopes for Expansion Scenario(s)

The Macroeconomic Analysis of Task 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 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 Macroeconomic analyses in Tasks 4 and 5. The Principal Investigators assume that the range of resource options that the SSC may chose from will include those that are not currently feasible but could become feasible in coming decades. These could include additional energy efficiency, demand response, CHP, clean coal/CCS, advanced nuclear, renewables such as wind, central solar, rooftop solar, geothermal (hydrothermal, geopressured, co-production/low-temp, enhanced geothermal systems), biopower, water (incremental and new hydro, ocean, hydrokinetics, pumped storage), and other storage technologies.

The Principal Investigators will incorporate state inputs<sup>4</sup> 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 Part B State body for endorsement.<sup>5</sup> The endorsed scope documents will provide the basis for the interregional expansion options to be considered in Task 7.

A draft Part I report will be developed by the Principal Investigators and provided for SSC and stakeholder review prior to the regional stakeholder workshop(s). The report will address the following<sup>6</sup>:

	Regional Plans	Interregional Options
Aggregated modeling of the existing Regional Plans	X	
Interregional Reliability Assessments for the Eastern Interconnection	X	X
Macroeconomic Analysis for multiple future expansion scenarios		X
Determine Expansion Scenarios for Interregional Transmission Options Development in Part II		X

<sup>4</sup> 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.

<sup>5</sup> The exact form of the endorsement or veto process will be determined later.

<sup>6</sup> Subject to legal and regulatory requirements for Critical Energy Infrastructure Information (CEII) and treatment of Confidential Information as noted in the Information Access section (2E of this revised SOPO)

The Principal Investigators, 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.

## **Part II (7/1/2011 - 6/30/2012)**

The Principal Investigators and their consultants will perform reliability and production cost analyses of alternative transmission options to support the expansion scenarios selected during Part I. High level cost estimates will also be developed for both the generation and transmission expansion facilities for each scenario.

### ***Task 7 Interregional Transmission Options Development***

Sub-Task Summary: a) Develop/adjust transmission solution for Detailed Transmission Analysis and b) Develop Power Flow for Each Scenario<sup>7</sup>

Key Inputs: Transmission Analysis Study Scopes for Expansion Scenario(s) from Task 6, Reference Cases from Task 2

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

In Task 7, the Principal Investigators will modify the reference power flow cases developed in Task 2 to build interregional expansion models. Task 7 will then focus on transmission reinforcements to support the interregional energy exchanges for each of the expansion scenario(s). The Principal Investigators will develop transmission expansion options focused on the extra high voltage transmission network (230 kV and above), but will also consider operating options and other potential solutions. The Principal Investigators 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 Principal Investigators will leverage the expertise of EIPC's membership in considering HVDC and advanced technologies in developing expansion options.

The output of Task 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 align with the future study period (e.g. 10, 15 or 20 years) selected for the Expansion Scenarios and will also receive high level cost estimates in Task 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.

---

<sup>7</sup> Variable Generation Analysis Task Eliminated from EIPC Scope. EIPC continues to support the need for such research in separate studies by others.

The Principal Investigators, with The Keystone Center providing coordination and facilitation services, will conduct stakeholder outreach and meetings to share preliminary results and solicit input from the SSC and other stakeholders.

**Task 8            *Reliability Review***

Sub-Task Summary: a) Perform Reliability Review per scenario and b) Review Detailed Transmission Analysis results with the SSC and Stakeholders

Key Inputs: Interregional Expansion modeling from Task 7

Key Deliverables: Reliability assessments of Interregional Expansion Options

The Principal Investigators 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 7. TVA will augment the capabilities of the Principal Investigators with provision of computational and technical capabilities to expedite this analysis. To the extent reliability issues are identified, these scenarios may be referred back to Task 7 for further review.

**Task 9            *Production Cost Analysis of each Scenario***

Key Inputs: Interregional Expansion modeling from Task 7, Flowgates identified during Task 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 7. Consistent with Task 3, production cost analysis will assess all 8760 hours of a future year 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 3, the economic analysis will be performed by CRA using GE MAPS.

**Task 10          *Generation and Transmission Costs***

Key Inputs: Interregional expansion options (G&T) from Tasks 6 & 7, High level, generic cost information

Key Deliverables: High Level cost estimates for expansion option facilities

Task 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 Principal Investigators using generic planning-type estimates<sup>8</sup> referenced to the study year and will represent “overnight” costs<sup>9</sup>.

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 11      Review of Results**

Sub-Task Summary: a) Review results and develop first draft of DOE Part II report, b) Review with SSC and solicit input on the draft report and c) Review Report during workshop with stakeholders

Key Inputs: Results from Tasks 1 through 10.

Key Deliverables: Review Report during workshop with stakeholders, Draft report, SSC input on draft report.

A draft Part II report will be developed by the Principal Investigators and provided for SSC and stakeholder review. The report will address the following<sup>10</sup>:

	Regional Plans	Interregional Options
Interregional Reliability Assessments for the Eastern Interconnection for up to three scenarios	X	X
Economic (production cost) analysis for future scenarios	X	X
Transmission expansion options and other potential solutions	X	X
Cost estimates for expansion options	X	X

The Principal Investigators, 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 12      Part II Report**

Sub-Task Summary: a) Incorporate stakeholder feedback and prepare/post Final Report

Key Inputs: Draft report and Stakeholder input from Task 11.

Key Deliverables: Final report and work papers

<sup>8</sup> For example, generic \$ per mile for transmission lines rather than detailed ROW routing and engineering cost estimates.

<sup>9</sup> “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.

<sup>10</sup> Subject to legal and regulatory requirements for Critical Energy Infrastructure Information (CEII) and treatment of Confidential Information

The Principal Investigators, with CRA providing technical support, will review the input received from the SSC and address it in the final Part II report. The Part II Report will be submitted to the Department on or before June 30, 2012.

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<sup>11</sup>.

---

<sup>11</sup> Ibid.