

Exhibit A WORK STATEMENT

TECHNICAL TASK LIST

Task #	CPR	Task Name
1		Administration
2		Procure and Install Production Quality Hardware at CAISO
3		Integrate Phasor Data with CAISO PI Historian
4	X	Automatic Event Analyzer
5		Transition Real Time Dynamics Monitoring System Visualization to Production Grade Quality
6		CAISO Phase Angle Baseline Analysis

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Jim Dyer/Lupe Garcia		
2	Ken Martin/Simon Mo		
3	Simon Mo / Vivek Bhaman		
4	Jim Dyer / Simon Mo		
5	Vivek Bhaman / Simon Mo		
6	Jim Dyer / John Ballance		

GLOSSARY

Specific terms and acronyms used throughout this scope of work are defined as follows:

Term/Acronym	Definition
ARRA	American Recovery and Reinvestment Act of 2009
BOA	Basic Ordering Agreement
BPA	Bonneville Power Authority
CAISO	California Independent System Operator
CERTS	Consortium for Electric Reliability Technology Solutions
CPR	Critical Project Review
DC	Direct Current Circuit
DOE	United States Department of Energy
Energy Commission	California Energy Commission
ePDC	enhanced Phasor Data Concentrator
EPG	Electric Power Group, LLC
EMS	Energy Management Systems
FOA	Funding Opportunity Announcement
GIS	Geographical Information System
HVDC	High-Voltage Direct Current
LADWP	Los Angeles Department of Water and Power
LBNL	Lawrence Berkeley National Laboratory

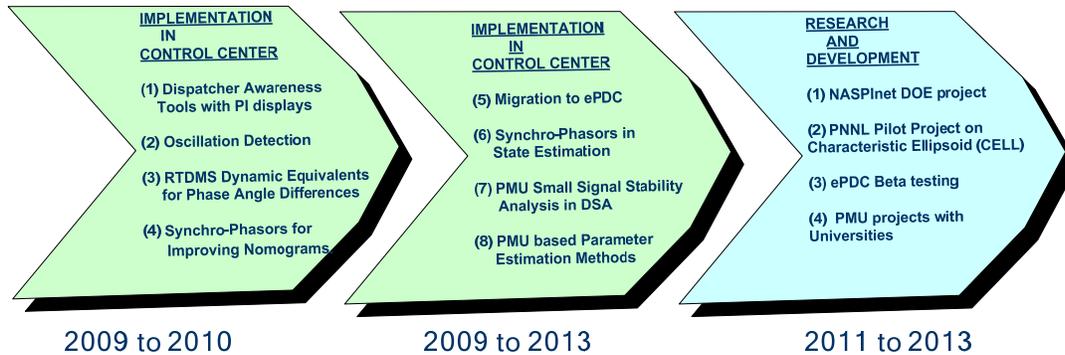
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Term/Acronym	Definition
MRA	Master Research Agreement
NASPI	North American SynchroPhasor Initiative
NERC	North American Electric Reliability Corporation
PAC	Project Advisory Committee
PDC	Phasor Data Concentrator
PG&E	Pacific Gas & Electric
PGDA	Phasor Grid Dynamics Analyzer
PI	Performance Index
PIER	Public Interest Energy Research
PMU	Phasor Measurement Unit
PNNL	Pacific Northwest National Lab
UCC.1	Uniform Commercial Code (Financing Statement)
R&D	Research and Development
RTDMS	Real Time Dynamics Monitoring System
SDG&E	San Diego Gas & Electric
SCADA	Supervisory Control and Data Acquisition Systems
SCE	Southern California Edison
SMIB	Single Machine Infinite Bus
SRP	Salt River Project
TAC	Technical Advisory Committee
TO	Transmission Owner(s)
TVA	Tennessee Valley Authority
U.S.	United States
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council
WISP	Western Interconnection Synchrophasor Project

Problem Statement:

California Independent System Operator (CAISO) has been a leader in research to advance the use of this next generation synchrophasor technology and provide leadership within California, Western Electricity Coordinating Council (WECC) and nationally. EPG has been CAISO's research partner and collaborator in synchrophasor technology research, development, demonstration, and deployment at CAISO. The CAISO has also developed a 5-year roadmap (Five Year Plan for Research in SynchroPhasors) for continued research and development (R&D) in the area of synchrophasor technology, implementation in the control room, and integration with operations as shown in the figure below.

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The Energy Commission award of about \$1 million is critical for Electric Power Group, LLC (EPG) to support the CAISO to meet its 5 year roadmap and plan for synchrophasor technology, provide a portion of the cost share for the DOE award, and integrate CAISO technology with Western Interconnection Synchrophasor Program (WISP). The participants in the WECC WISP project include WECC, CAISO, Southern California Edison, EPG, Idaho Power, PacifiCorp, Bonneville Power Administration, and other entities from WECC.

CAISO and EPG are also participants in the Western Electricity Coordinating Council's (WECC) project for the WISP that has a total project cost of \$108 million and has received an award from the United States Department of Energy (DOE) of \$54 million or 50% of total project cost. The total project cost of \$108 million comprises of \$64 million for WECC portion of the synchrophasor project and \$44 million for Pacific Gas and Electric (PG&E) as a sub awardee. The \$64 million synchrophasor portion of the WISP project includes DOE's cost share award of \$32 million for interconnection wide phasor infrastructure network, visualization and situational awareness, controls, renewable integration and analysis.

The WECC included the California Energy Commission Public Interest Energy Research (PIER) funding award to EPG for DOE cost share and leverage Energy Commission investment (award to EPG of \$1.7 million under PIER Agreement 500-08-048 and \$1 million under this agreement for a total of \$2.7 million) for cost share towards the \$32 million of the DOE match for the WISP for the interconnection wide synchrophasor project. The \$32 million DOE funds will be used by WISP for the WISP project under the oversight of a Technical Advisory Committee which includes representation from CAISO.

Goals of the Agreement:

The goals of this Agreement are to:

- Work with the CAISO on the necessary infrastructure investments for production grade hardware, interfaces to integrate with CAISO performance index (PI) historian, analysis, applications, and research for the CAISO Synchrophasor Technology Investments and Implementation Project
- Support CAISO participation in the WECC WISP.

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- Integrate CAISO's synchrophasor technology initiative with WECC's WISP project.

Objectives of the Agreement:

The objectives of this Agreement are to:

- Work with the CAISO's production quality hardware infrastructure investment, data integration, applications, analysis and research to implement various aspects of phasor technology that are deemed as necessary steps towards adopting and operationalizing this technology to bring the benefits of improved reliability, integration of renewable, improved use of existing transmission assets, and market efficiency to consumers in California and the WECC.
- Carry out the installation of production quality computer hardware to run synchrophasor software at CAISO, improving existing prototype and test applications for visualization, baselining analysis and integration of new PMU devices, and integration of synchrophasor data bases with CAISO existing PI historian.
- Support CAISO participation and linkages with the WISP.

The Tasks for this project describe activities to be performed in coordination with CAISO. CAISO is currently utilizing Real Time Dynamics Monitoring System (RTDMS) and *enhanced* PDC (ePDC) applications. CAISO needs to transition these to a production quality hardware infrastructure with redundancy. Tasks 2 and 5 are designed to install production quality hardware, and transition RTDMS visualization in use at CAISO to production grade system with redundancy.

The WECC-WISP project can be grouped into three major activities or Tasks as follows:

- i. Project Management – budget of \$7.3 million of which DOE provides \$3.8 million and match funds provides \$3.5 million. This corresponds to Task 1 of EPG's work statement.
- ii. Infrastructure – budget of \$33.5 million of which DOE provides \$17.8 million and match funds provides \$15.7 million. This corresponds to Task 2 of EPG's work statement.
- iii. Applications/Visualization – budget of \$20.4 million of which DOE provides \$10.4 million and match funds provides \$10 million. This corresponds to Task 5 of EPG's work statement.

The WECC-WISP activities for infrastructure and applications/visualization are summarized below:

Infrastructure

- The large-scale (250-300) deployment of phasor measurement units (PMU) and phasor data concentrators (PDC) throughout the U.S. portion of the Western Interconnection.
- The design and implementation of a new private wide-area network backbone that meets the performance, high-availability, any-to-any

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communication, reliability and security requirements for real-time phasor data exchange between the entities located in the United States (U.S.) portion of the Western Interconnection and WECC.

- The planning, design, coordination, and demonstration of WECC's ability to integrate synchrophasor data exchange through North American Synchrophasor Initiative network (NASPInet).

Applications/Visualization

- The expansion of existing WECC data center facilities to support new system infrastructure and technology. This enables the aggregation and integration of synchrophasor data and energy management software packages to provide visualization for system-wide situational awareness. Model and performance analysis, and real-time controls.

Product Guidelines:

For complete product guidelines, refer to Section 5 in the Terms and Conditions.

TASK 1 ADMINISTRATION

Task 1.1 Attend Kick-off Meeting

The goal of this task is to establish the lines of communication and procedures for implementing this Agreement.

The Recipient shall:

- Attend a "Kick-Off" meeting with the Commission Project Manager, the Grants Officer, and a representative of the Accounting Office. The Recipient shall bring its Project Manager, Agreement Administrator, Accounting Officer, and others designated by the Commission Project Manager to this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Commission Project Manager will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, the following:

- Discussion of the terms and conditions of the Agreement
- Discussion of Critical Project Review (Task 1.2)
- Match fund documentation (Task 1.6)
- Permit documentation (Task 1.7)

The technical portion of the meeting shall include, but not be limited to, the following:

- The Commission Project Manager's expectations for accomplishing tasks described in the Scope of Work
- An updated Schedule of Products
- Discussion of Progress Reports (Task 1.4)

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- Discussion of Technical Products (Product Guidelines located in Section 5 of the Terms and Conditions)
- Discussion of the Final Report (Task 1.5)

The Commission Project Manager shall designate the date and location of this meeting.

Recipient Products:

- Updated Schedule of Products
- Updated List of Match Funds
- Updated List of Permits

Commission Project Manager Product:

- Kick-Off Meeting Agenda

Task 1.2 Critical Project Review (CPR) Meetings

The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and to identify any needed modifications to the tasks, products, schedule or budget.

CPRs provide the opportunity for frank discussions between the Energy Commission and the Recipient. CPRs generally take place at key, predetermined points in the Agreement, as determined by the Commission Project Manager and as shown in the Technical Task List above. However, the Commission Project Manager may schedule additional CPRs as necessary, and any additional costs will be borne by the Recipient.

Participants include the Commission Project Manager and the Recipient and may include the Commission Grants Officer, the Public Interest Energy Research (PIER) Program Team Lead, other Energy Commission staff and Management as well as other individuals selected by the Commission Project Manager to provide support to the Energy Commission.

If DOE is conducting similar meetings, the Recipient shall notify and invite the Commission project manager to participate, either by teleconference or by actual meeting attendance. The DOE required meetings can be used in place of the Commission's CPR meetings, at the discretion of the Commission project manager.

The Commission Project Manager shall:

- Determine the location, date, and time of each CPR meeting with the Recipient. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Recipient the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on both match funding and permits.

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- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not modifications are needed to the tasks, schedule, products, and/or budget for the remainder of the Agreement. Modifications to the Agreement may require a formal amendment (please see the Terms and Conditions). If the Commission Project Manager concludes that satisfactory progress is not being made, this conclusion will be referred to the Energy Commission's Research, Development and Demonstration (RD&D) Policy Committee for its concurrence.
- Provide the Recipient with a written determination in accordance with the schedule. The written response may include a requirement for the Recipient to revise one or more product(s) that were included in the CPR.

The Recipient shall:

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other products identified in this scope of work. The Recipient shall submit these documents to the Commission Project Manager and any other designated reviewers at least 15 working days in advance of each CPR meeting.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.
- Recipient will provide copies of any DOE correspondence (emails, reports, letters, etc.) that relate to the project status. This includes copies of project performance reviews on Recipient work and summaries and results of project review meetings with DOE.

Commission Project Manager Products:

- Agenda and a list of expected participants
- Schedule for written determination
- Written determination

Recipient Product:

- CPR Report(s)
- DOE correspondence and reporting

Task 1.3 Final Meeting

The goal of this task is to closeout this Agreement. If DOE is conducting a similar final meeting, the Recipient shall notify and invite the Commission Project Manager to participate, either by teleconference or by actual meeting attendance. The DOE required meeting can be used in place of the Commission's final meeting, at the

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discretion of the Commission project manager. However, all items listed in this task will need to be covered in the meeting.

The Recipient shall:

- Meet with Energy Commission staff to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

This meeting will be attended by, at a minimum, the Recipient, the Commission Grants Office Officer, and the Commission Project Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Commission Project Manager.

The technical portion of the meeting shall present an assessment of the degree to which project and task goals and objectives were achieved, findings, conclusions, recommended next steps (if any) for the Agreement, and recommendations for improvements. The Commission Project Manager will determine the appropriate meeting participants.

The administrative portion of the meeting shall be a discussion with the Commission Project Manager and the Grants Officer about the following Agreement closeout items:

- What to do with any equipment purchased with Energy Commission funds (Options)
- Energy Commission's request for specific "generated" data (not already provided in Agreement products)
- Need to document Recipient's disclosure of "subject inventions" developed under the Agreement
- "Surviving" Agreement provisions, such as repayment provisions and confidential Products
- Final invoicing and release of retention
- Prepare a schedule for completing the closeout activities for this Agreement.
- Copies of all correspondence and reports discussing DOE's findings on the project, and future disposition of the project, if applicable. When directed by the Commission Project Manager, the Recipient will provide copies of any DOE correspondence (emails, reports, letters, etc.) that relate to project performance.

Products:

- Written documentation of meeting agreements
- Schedule for completing closeout activities
- DOE correspondence on project findings and results

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Task 1.4 Monthly Progress Reports

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the research objectives of this Agreement on time and within budget.

The objectives of this task are to summarize activities performed during the reporting period, to identify activities planned for the next reporting period, to identify issues that may affect performance and expenditures, and to form the basis for determining whether invoices are consistent with work performed.

With Commission project manager approval, the Recipient can submit a DOE Progress Report in lieu of the required Commission report if contains the information listed in Attachment 1 of the Terms and Conditions.

The Recipient shall:

- Prepare Monthly Progress Reports which summarize all Agreement activities conducted by the Recipient for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the Commission Project Manager within 10 days of the end of the reporting period. The recommended specifications for each progress report are contained in the terms and conditions of this Agreement.
- Unless otherwise directed by the Commission project manager, each Progress Report must contain any reports made to DOE, including summaries of meetings with DOE, as it that relates to the project outcome and performance. Include names and contacts of DOE representatives.

Product:

- Monthly Progress Reports
- Copies of DOE reporting and meeting summaries

Task 1.5 Final Report

The goal of the Final Report is to assess the project's success in achieving its goals and objectives, advancing science and technology, and providing energy-related and other benefits to California.

The final report shall describe the following at a minimum: a) original purpose, approach, activities performed, results and conclusions of the work done under this Agreement; b) how the project advanced science and technology to the benefit of California's ratepayers and the barriers overcome; c) assessment of the success of the project as measured by the degree to which goals and objectives were achieved; d) how the project supported California's economic recovery in the near term and number of jobs created or sustained; e) how the project results will be used by California industry, markets and others; f)

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projected cost reduction impact and other benefits resulting from the project; g) discuss the project budget, including the total project cost and all the funding partners and their cost share; h) discuss how the Energy Commission funding was spent on the project, including any unique products and benefits; i) observations, conclusions and recommendations for further RD&D projects and improvements to the PIER project management process.

If a final report is required by DOE, the Recipient will include a copy of it along with the Energy Commission's final report requirements. In addition, the Recipient shall submit the draft final DOE report to the Energy Commission for review at the same time it submits it to DOE.

The Final Report shall be a public document. If the Recipient has obtained confidential status from the Energy Commission and will be preparing a confidential version of the Final Report as well, the Recipient shall perform the following activities for both the public and confidential versions of the Final Report.

The Recipient shall:

- Provide a draft copy of the Final Report including a copy of the draft submitted to the U.S. DOE in response to the American Recovery and Reinvestment Act Funding Opportunity Notice for which an award was received. The Final Report must be completed on or before the end of the Agreement Term.
- Submit written correspondence from DOE regarding acceptance of the final report.

Products:

- Draft Final Report, including a copy of the draft report submitted to DOE
- Final Report, including a copy of the final report submitted to DOE
- Written correspondence from DOE regarding acceptance of final report

Task 1.6 Identify and Obtain Matching Funds

The goal of this task is to ensure that the match funds planned for this Agreement are obtained for and applied to this Agreement during the term of this Agreement.

The costs to obtain and document match fund commitments are not reimbursable through this Agreement. Although the PIER budget for this task will be zero dollars, the Recipient may utilize match funds for this task. Match funds shall be spent concurrently or in advance of PIER funds for each task during the term of this Agreement. Match funds must be identified in writing and the associated commitments obtained before the Recipient can incur any costs for which the Recipient will request reimbursement.

The Recipient shall:

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- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Commission Project Manager at least 2 working days prior to the kick-off meeting. The letter needs to identify the following at a minimum:
 - Amount of each cash match fund, its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied.
 - Amount of each in-kind contribution, a description, documented market or book value, and its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Recipient shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.
- Provide a copy of the letter of commitment from an authorized representative of each source of cash match funding or in-kind contributions that these funds or contributions have been secured.
- Discuss match funds and the implications to the Agreement if they are reduced or not obtained as committed, at the kick-off meeting. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide the appropriate information to the Commission Project Manager if during the course of the Agreement additional match funds are received.
- Notify the Commission Project Manager within 10 days if during the course of the Agreement existing match funds are reduced. Reduction in match funds must be approved through a formal amendment to the Agreement and may trigger an additional CPR.

Products:

- A letter regarding match funds
- Copy(ies) of each match fund commitment letter(s)
- Letter(s) for new match funds (if applicable)
- Letter that match funds were reduced (if applicable)

Task 1.7 Identify and Obtain Required Permits

The goal of this task is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track.

Permit costs and the expenses associated with obtaining permits are not reimbursable under this Agreement. Although the PIER budget for this task will be zero dollars, the Recipient shall budget match funds for any expected expenditures associated with obtaining permits. Permits must be identified in writing and obtained before the Recipient can make any expenditures for which a permit is required.

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The Recipient shall:

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Commission Project Manager at least 2 working days prior to the kick-off meeting. If there are no permits required at the start of this Agreement, then state such in the letter. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, provide in the letter:
 - A list of the permits that identifies the:
 - Type of permit
 - Name, address and telephone number of the permitting jurisdictions
 - or lead agencies
 - The schedule the Recipient will follow in applying for and obtaining these permits.
- Discuss the list of permits and the schedule for obtaining them at the kick-off meeting and develop a timetable for submitting the updated list, schedule and the copies of the permits. The implications to the Agreement if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in the Progress Reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, provide the appropriate information on each permit and an updated schedule to the Commission Project Manager.
- As permits are obtained, send a copy of each approved permit to the Commission Project Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Commission Project Manager within 5 working days. Either of these events may trigger an additional CPR.

Products:

- Letter documenting the permits or stating that no permits are required
- A copy of each approved permit (if applicable)
- Updated list of permits as they change during the term of the Agreement (if applicable)
- Updated schedule for acquiring permits as changes occur during the term of the Agreement (if applicable)

TECHNICAL TASKS

Unless otherwise provided in the individual Task, the Recipient shall prepare all products in accordance with the requirement in the Special Conditions

TASK 2 PROCURE AND INSTALL PRODUCTION QUALITY HARDWARE AT CAISO

The goal of this task is to transition the CAISO phasor system onto production-grade hardware to run synchrophasor software applications.

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The Recipient shall:

- Work with CAISO to procure and install the production quality hardware to run synchrophasor applications at CAISO.
- Review Phasor Network Architecture Design for Reliability. The architecture for a production grade network at the CAISO will include:
 - Production Environment
 - Staging Environment
 - Testing Environment
- Facilitate integration with the WECC's developing Phasor network.
- Prepare and provide a draft and final architectural design diagram of the phasorsystem and documents describing the phasor system.
- Download, test, and install on production quality hardware EPG's Real-Time Dynamics Monitoring System (RTDMS) and enhanced Phasor Data Concentrator (ePDC) software in use at CAISO, and assist in installation of hardware and software at CAISO's primary system, backup system, and test system at Folsom and Alhambra, CA.

Products:

- Draft Architectural Design of the Phasor System.
- Final Architectural Design of the Phasor System.

TASK 3 INTEGRATE PHASOR DATA WITH CAISO PI HISTORIAN

The goal of this task is to implement an end-to-end solution that directly integrates EPG's software applications that are in use at CAISO – the Real Time Dynamics Monitoring System (RTDMS) and the Offline Phasor Grid Dynamics Analyzer (PGDA) – with the PI Historian.

The Recipient shall:

- Integrate phasor data performance assessment to either:
 - Directly into PI
 - Use a redundant link to Energy Management Systems (EMS) such as the ABB PCU 400 platform
- Prepare Functional Specification and Database Schematic Specification documents for integration of the RTDMS and PGDA applications with the PI Historian/EMS.
- Review Specification documents with CAISO staff.
- Prepare Test Cases and Test Procedures for testing interfaces.
- Implement RTDMS-PI/EMS and PGDA-PI/EMS interfaces and conduct factory and field testing at CAISO.
- Conduct a demonstration at CAISO of EPG's software integrated with either the PI Historian or EMS.

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Products:

- Draft Functional Specifications
- Final Functional Specifications

TASK 4 AUTOMATIC EVENT ANALYZER

The goal of this task is to develop a tool that will automatically retrieve and compile the relevant phasor information into a meaningful summary of an event. This automatic event analyzer will describe the condition of the grid immediately prior to the sudden event, and identify the sequence of events (within the limits of the phasor points being monitored) leading up to the sudden event.

The Recipient shall:

- Conduct an assessment of the types of automatic analysis that can be performed using available data from the CAISO phasor measurement system.
- Prepare draft and final Functional Specifications and an analysis framework for integration of an automatic event analyzer into the CAISO phasor measurement system.
- Meet with CAISO staff to review Specification document.
- Integrate automatic event analyzer with RTDMS visualization display system.
- Review prototype systems with CAISO staff.
- Conduct a demonstration at CAISO of a prototype automatic event analyzer system integrated with RTDMS.
- Participate in CPR as per Task 1.2.

Products:

- Draft Functional Specifications
- Final Functional Specifications

TASK 5 TRANSITION RTDMS VISUALIZATION TO A PRODUCTION GRADE QUALITY

The goal of this task is to improve the situational awareness displays for the CAISO system operators.

The Recipient shall:

- Coordinate with CAISO users to determine operational and engineering display needs and preferences.
- Conduct literature search to determine the best display technologies available and which are compatible with the CAISO user needs.
- Prepare and develop a functional specification for the proposed display improvement and review it with the CAISO staff.
- Implement changes in a test environment and evaluate.
- Transition the display improvements to the operational system.

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- Conduct a demonstration at CAISO of an improved display capability.

Products:

- Draft Functional Specifications for Display Improvements
- Final Functional Specifications for Display Improvements

TASK 6 CAISO PHASE ANGLE BASELINE ANALYSIS

The goal of this task is to (1) review and compare the phasor data being received at the CAISO with the CAISO's state estimator data and discrepancies will be discussed with the appropriate TO, for their resolution, (2) to perform an initial phase angle baseline analysis for the CAISO's portion of the WECC grid, and (3) to document the entire analysis process and determine the feasibility of developing an annual automated process.

The Recipient shall:

- Coordinate research activities with CAISO (including Transmission Owners (TOs)) and coordinate with other WECC members including, as appropriate, Bonneville Power Authority, Los Angeles Department of Water and Power, Arizona Public Service and Salt River Project.
- Review and compare the data being received from new and existing PMUs with CAISO's state estimator data and identify data quality issues.
- Coordinate and support the California TOs in their resolution of PMU, PDC, and telecommunications data quality issues.
- Compile the necessary CAISO and adjacent utilities phasor, SCADA , and state estimator data to be utilized in the analysis.
- Pre-process the data to address data quality issues, such as data dropouts or glitches and modify data as required.
- Utilize software to analyze phase angle data from the database and develop baseline understanding of voltage phase angle patterns at key monitoring locations and during the different seasons.
- Document the entire analysis process.
- Perform an assessment on the availability of the required phasor data and the feasibility to automate the analysis process.
- Present and discuss initial findings with CAISO and other stakeholders.
- Prepare a functional specification document (draft) if automation of the analysis processes is deemed feasible and data is available.
- Prepare baselining analysis results as excel spreadsheet and charts, including:
 - Voltage phase angle trends (1-minute average)
 - Voltage phase angle statistics (mean, maximum and minimum) separated by season, on-peak/off-peak, weekdays/weekends.
 - Voltage phase angle distribution functions.
- Prepare system performance analysis results as excel spreadsheets and charts using data 5-minute intervals, such as:
 - Voltage – Power sensitivities for load centers and major interties.

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- Angle – Power sensitivities across major paths.
- A report of a correlation analysis between performance measures and system measurements with greater emphasis of the stressed system conditions, particularly during on-peak summer conditions.
- Prepare a report of the analysis process and feasibility of automating the process.
- Baseline analysis results briefing.

Products:

- Draft Report Analysis Process and Feasibility of Automating the Process
- Final Report Analysis Process and Feasibility of Automating the Process