

Exhibit A SCOPE OF WORK

TECHNICAL TASK LIST

Task #	CPR	Task Name
1	N/A	Administration
2	X	Instrument Deployment, Data Acquisition from Regional Networks, Quality Control (Qc), and Analysis
3	X	Solar Forecast System
4		Conduct Data Assimilation And Optimization to Derive Best Mix off Forecast Products
5		Technology Transfer Activities

KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)	Key Partner(s)
1	Marie Schnitzer	MESO	
2	Marie Schnitzer	UCSD, AWST, Servitek (DVBE)	CAISO, SEMPRA
3	Marie Schnitzer	UCSD, CPWR, MESO, Servitek	CAISO
4	Marie Schnitzer	UCSD, CPWR, MESO, Servitek	CAISO
5	Marie Schnitzer	MESO	CAISO

GLOSSARY

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

Acronym	Definition
AWST	AWS Truepower
CAISO	California Independent System Operator
CPR	Critical Project Review
CPWR	Clean Power Research
DOE	United States Department of Energy
Energy Commission	California Energy Commission
km	kilometer
MW	Megawatt
NREL	National Renewable Energy Laboratory
NWP	Numerical Weather Prediction
PIER	Public Interest Energy Research

Acronym	Definition
PV	Photovoltaic
QC	Quality Control
TSI	Total Sky Imagers
UCC.1	Uniform Commercial Code (Financing Statement)
UCSD	University of California, San Diego
USRE	Utility Scale Renewable Energy

Problem Statement

The objective of this agreement is to configure, demonstrate and validate an operational solar forecasting service for California that provides short-term forecasts (~15 minutes up to next day) of solar-based generation that are updated several times per day. The primary goal is to equip system operators with timely and accurate foreknowledge of ‘next-hour’ and ‘next-day’ solar-based generation so that they can readily accommodate the increasing penetration of this type of generation while balancing other resources and maintaining high levels of grid reliability. This initiative will incorporate state-of-the-art forecasting and statistical techniques while configuring technological improvements that are customized for California’s unique climate and utility operating environment.

According to the United States Department of Energy (DOE), the need for reliable solar resource forecasts is becoming more important each year as increasing amounts of solar-generated electricity is incorporated into the electric grid. In order to incorporate solar resources into an electric grid, capabilities at various intervals need to be configured. These include: short-term forecasting of less than 1 hour to 3 hours ahead (regulating frequency and following load); day-ahead forecasts (committing generation units); and long-term forecasts (system planning and economic analysis) <http://www1.eere.energy.gov/solar/forecasting.html>. Current efforts in solar forecasting are being lead by NREL and involve testing the use of Total Sky Imagers (TSI) to supplement existing solar forecasting capabilities.

Early solar forecasting attempts used model output statistics (Jensenius and Cotton, 1981) or artificial neural networks (Elizondo et al., 1994, Guarnieri et al., 2008). For physically-based forecasting, cloud cover and cloud optical depth are the most important parameters affecting solar irradiance. Clouds can be detected, characterized, and advected to predict solar irradiance accurately up to six hours in advance using satellite technology or ground-based observation platforms such as TSI (Hamill and Nehrkorn, 1993; Hammer et al. 1999). Forecasts beyond six hours, up to several days ahead, are generally most accurate if derived from Numerical Weather Prediction (NWP) models. Due to complex cloud microphysics and limitations in spatial resolution, clouds and their radiative properties are difficult to predict in numerical models.

A particular challenge to steady power production from solar energy plants is steep power ramps caused by the shadows of relatively fast moving, low-level cumulus or stratocumulus clouds. A sufficiently dense network of instruments is needed to configure a robust statistical description of cloud shadows crossing a prospective solar system array. Therefore, the project site, an operating solar farm in Henderson, Nevada, will be capably instrumented to capture the fine-scale temporal and spatial variability of the cloud-light environment.

This project will integrate TSIs into solar energy forecasting with satellite and NWP models. The plan envisions using two TSIs to collect cloud development, movement and coverage near and around a 48 Megawatt (MW) solar photovoltaic (PV) plant for the purpose of forecasting intra-hour solar energy production. The primary purpose of the study is to forecast shading and power output of the plant up to one hour ahead. The Contractor and Subcontractors will attempt to provide these forecasts in near real-time for at least 12 months. If actual forecasting is not possible, the project will focus on the analysis of historical data, i.e. “forecasting in hindsight”.

Goals of the Agreement

The goal of this project is to facilitate grid integration of Utility Scale Renewable Energy (USRE) through forecasting and monitoring of variable output renewable energy.

Objectives of the Agreement

The objective of this project is to configure, demonstrate, validate and integrate a set of solar forecasting tools for California that provides the highest possible performance for frequently updated forecasts of solar power production on multiple time scales ranging from a few minutes to several days ahead.

One of the significant applications of solar energy forecasts in California is to support the grid management activities of the California Independent System Operator (CAISO). CAISO needs solar power production forecasts from individual solar generating facilities and aggregates of smaller generation resources in three specific time periods: (1) day-ahead (18-42 hours before the operating hour), (2) real-time (105 minutes before the operating hour) and (3) intra-hour (every 15 minutes for the next 2 hours). These are the primary look-ahead time periods of interest for the proposed project.

TASK 1.0 ADMINISTRATION

MEETINGS

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 Contractor shall:

- Attend a “kick-off” meeting with the California Energy Commission (Energy Commission) Contract Manager, the Contracts Officer, and a representative of the Accounting Office. The Contractor shall bring their Project Manager, Contracts Administrator, Accounting Officer, and others designated by the Energy Commission Contract 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 Energy Commission Contract 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:

- Terms and conditions of the Agreement
- Critical Project Reviews (CPRs) (Task 1.2)
- Match fund documentation (Task 1.7)
- Permit documentation (Task 1.8)

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

- The Energy Commission Contract Manager's expectations for accomplishing tasks described in the Scope of Work;
- An updated Schedule of Deliverables
- Progress Reports (Task 1.4)
- Technical Deliverables (Task 1.5)
- Final Report (Task 1.6)

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

Contractor Deliverables:

- An Updated Schedule of Deliverables
- An Updated List of Match Funds

Energy Commission Contract Manager Deliverables:

- Kickoff Meeting Agenda

Task 1.2 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 if it should, are there any modifications that need to be made to the tasks, deliverables, schedule or budget.

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

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

The Energy Commission Contract Manager shall:

- Determine the location, date and time of each CPR meeting with the Contractor. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Contractor 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.
- 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 to modify the tasks, schedule, deliverables and budget for the remainder of the Agreement, including not proceeding with one or more tasks. If the Energy Commission Contract Manager concludes that satisfactory progress is not being made, this conclusion will be referred to the Energy Commission's Research, Development and Demonstration Policy Committee for its concurrence.
- Provide the Contractor with a written determination in accordance with the schedule. The written response may include a requirement for the Contractor to revise one or more deliverable(s) that were included in the CPR.

The Contractor 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 deliverables identified in this Scope of Work. Submit these documents to the Energy Commission Contract 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.

Contractor Deliverables:

- CPR Report(s)
- CPR deliverables identified in the Scope of Work

Energy Commission Contract Manager Deliverables:

- Agenda and a List of Expected Participants
- Schedule for Written Determination
- Written Determination

Task 1.3 Final Meeting

The goal of this task is to closeout this Agreement.

The Contractor shall:

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

This meeting will be attended by, at a minimum, the Contractor, the Energy Commission Contracts Officer, and the Energy Commission Contract 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 Energy Commission Contract Manager.

The technical portion of the meeting shall present findings, conclusions, and recommended next steps (if any) for the Agreement. The Energy Commission Contract Manager will determine the appropriate meeting participants.

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

- What to do with any state-owned equipment (Options)

- Need to file UCC.1 form re: Energy Commission's interest in patented technology
 - Energy Commission's request for specific "generated" data (not already provided in Agreement deliverables)
 - Need to document Contractor's disclosure of "subject inventions" developed under the Agreement
 - "Surviving" Agreement provisions, such as repayment provisions and confidential deliverables
 - Final invoicing and release of retention
- Prepare a schedule for completing the closeout activities for this Agreement.

Deliverables:

- Written documentation of meeting agreements and all pertinent information
- Schedule for completing closeout activities

REPORTING

See Exhibit D, Reports/Deliverables/Records.

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.

The Contractor shall:

- Prepare progress reports which summarize all Agreement activities conducted by the Contractor 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 Energy Commission Contract Manager within 10 working days after the end of the reporting period. Attachment A-2, Progress Report Format, provides the recommended specifications.

Deliverables:

- Monthly Progress Reports

Task 1.5 Test Plans, Technical Reports and Interim Deliverables

The goal of this task is to set forth the general requirements for submitting test plans, technical reports and other interim deliverables, unless described differently in the Technical Tasks. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Energy Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's web site:

<http://www.energy.ca.gov/contracts/pier/contractors/index.html>

The Contractor shall:

- Unless otherwise directed in this Scope of Work, submit a draft of each deliverable listed in the Technical Tasks to the Energy Commission Contract Manager for review and comment in accordance with the approved Schedule of Deliverables. The Energy Commission Contract Manager will provide written comments back to the Contractor on the draft deliverable within 10 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final deliverable to the Energy Commission Contract Manager. The Energy Commission Contract Manager shall provide written approval of the final deliverable within 5 working days of receipt. Key elements from this deliverable shall be included in the Final Report for this project.

Task 1.6 Final Report

The goal of this task is to prepare a comprehensive written Final Report that describes the original purpose, approach, results and conclusions of the work done under this Agreement. The Energy Commission Contract Manager will review and approve the Final Report. The Final Report must be completed on or before the termination date of the Agreement. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Energy Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's web site:

<http://www.energy.ca.gov/contracts/pier/contractors/index.html>

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

Task 1.6.1 Final Report Outline**The Contractor shall:**

- Prepare a draft outline of the Final Report.
- Submit the draft outline of Final Report to the Energy Commission Contract Manager for review and approval. The Energy Commission Contract Manager will provide written comments back to the Contractor on the draft outline within 10 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final outline to the Energy Commission Contract Manager. The Energy Commission Contract Manager shall provide written approval of the final outline within 5 working days of receipt.

Deliverables:

- Draft Outline of the Final Report
- Final Outline of the Final Report

Task 1.6.2 Final Report**The Contractor shall:**

- Prepare the draft Final Report for this Agreement in accordance with the approved outline.
- Submit the draft Final Report to the Energy Commission Contract Manager for review and comment. The Energy Commission Contract Manager will provide written comments within 10 working days of receipt.

Once agreement on the draft Final Report has been reached, the Energy Commission Contract Manager shall forward the electronic version of this report for Energy Commission internal approval. Once the approval is given, the Energy Commission Contract Manager shall provide written approval to the Contractor within 5 working days.

- Submit one bound copy of the Final Report with the final invoice.

Deliverables:

- Draft Final Report
- Final Report

MATCH FUNDS, PERMITS, AND ELECTRONIC FILE FORMAT

Task 1.7 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. While the PIER budget for this task will be zero dollars, the Contractor may utilize match funds for this task. Match funds shall be spent concurrently or in advance of PIER funds during the term of this Agreement. Match funds must be identified in writing, and the associated commitments obtained before the Contractor can incur any costs for which the Contractor will request reimbursement.

The Contractor shall:

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Energy Commission Contract Manager at least 2 working days prior to the kick-off meeting:
 1. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state such in the letter.
 2. If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter:
 - A list of the match funds that identifies the:
 - 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 Contractor shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.
 - 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 significantly 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 Contract Manager if during the course of the Agreement additional match funds are received.
- Notify the Commission Contract Manager within 10 working days if during the course of the Agreement existing match funds are reduced. Reduction in match funds may trigger an additional CPR.

Deliverables:

- A letter regarding Match Funds or stating that no Match Funds are provided
- Letter(s) for New Match Funds
- A copy of each Match Fund commitment letter
- Letter that Match Funds were Reduced (if applicable)

Task 1.8 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. While the PIER budget for this task will be zero dollars, the Contractor shall show match funds for this task. Permits must be identified in writing and obtained before the Contractor can incur any costs related to the use of the permits for which the Contractor will request reimbursement.

The Contractor shall:

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Energy Commission Contract Manager at least 2 working days prior to the kick-off meeting:
 1. If there are no permits required at the start of this Agreement, then state such in the letter.
 2. 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
 - Schedule the Contractor will follow in applying for and obtaining these permits.
- The list of permits and the schedule for obtaining them will be discussed at the kick-off meeting, and a timetable for submitting the updated list, schedule and the copies of the permits will be developed. 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, then provide the appropriate information on each permit and an updated schedule to the Energy Commission Contract Manager.
- As permits are obtained, send a copy of each approved permit to the Energy Commission Contract Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Energy Commission Contract Manager within 5 working days. Either of these events may trigger an additional CPR.

Deliverables:

- A letter documenting the Permits or stating that no Permits are required
- Updated list of Permits as they change during the Term of the Agreement
- Updated schedule for acquiring Permits as it changes during the Term of the Agreement
- A copy of each approved Permit

Task 1.9 Electronic File Format

The goal of this task is to unify the formats of electronic data and documents provided to the Energy Commission as contract deliverables. Another goal is to establish the computer platforms, operating systems and software that will be required to review and approve all software deliverables.

The Contractor shall:

- Deliver documents to the Energy Commission Contract Manager in the following formats:
 - Data sets shall be in Microsoft (MS) Access or MS Excel file format.
 - PC-based text documents shall be in MS Word file format.
 - Documents intended for public distribution shall be in PDF file format, with the native file format provided as well.
 - Project management documents shall be in MS Project file format.
- Request exemptions to the electronic file format in writing at least 90 days before the deliverable is submitted.

Deliverables:

- A letter requesting exemption from the Electronic File Format (if applicable)

TECHNICAL TASKS

The Contractor shall prepare all deliverables in accordance with the requirements in Task 1.5. Deliverables not requiring a draft version are indicated by marking “(no draft)” after the deliverable name.

Task 2.0 INSTRUMENT DEPLOYMENT, DATA ACQUISITION FROM REGIONAL NETWORKS, QUALITY CONTROL (QC), AND ANALYSIS

The goal for this task is to gather validated and quality controlled on site measurements which will allow evaluation of the forecasting system meet the objectives of the project.

Task 2.1 Measurements at the Target Site—Forecast Of Intra-Hour Solar Production

The goal of this task is to install and maintain solar observation equipment at the Henderson, Nevada, USRE plant.

The Contractor shall:

- Deploy forecasting instrumentation
- Conduct data QC and site visits
- Prepare a Data Availability Report which will include, but not be limited to:
 - Data availability,
 - Data recovery, and
 - Data loss information.

Deliverables:

- Data Availability Report (no draft)

Task 2.2 Identification, Data Acquisition, And QC Of Existing Data Networks For Larger Spatial And Temporal Scales

The goal of this task is to identify and qualify the availability of regional solar resource and other meteorological observations (such as cloud fraction) that will be necessary to serve as model inputs and model correction variables, as well as for additional forecast validation (ground truth) points.

The Contractor shall:

- Conduct a survey of existing irradiance, meteorological, and satellite resource data sources that may be used for the solar forecasting system and historical data analysis.
- Document and characterize by measurement type the location, period of record, sampling and recording interval, availability, organization point-of-contact, and other descriptors including compatibility of use of data for modeling and forecasting.
- Assess the data quality of identified observation networks through the review of available calibration records, a screening of sample data sets, and, if necessary, a field inspection of selected sites.
- Based upon irradiance and cloud climatologies, produce a statistical description of the spectrum of ramp events to be expected over the project area
- Configure protocols on a data collection and assimilation plan to routinely acquire and compile data from existing and new sources for the benefit of the solar forecasting system.
- Identify the added value and limitations of the local observation facilities.
- Institute efficient data communication links and upgrade the quality/quantity of resource/performance measurements.
- Prepare a report summarizing recommendations on a data collection and assimilation plan.

Deliverables:

- Data Collection and Assimilation Plan Report (no draft)

Task 2.3 Near Real-Time Data Analysis and QC

The goal of this task is to configure an automated QC algorithm to ensure time series continuity for the targeted variables used by the forecast system, with removal or substitution through interpolation of anomalous (e.g. spikes) values in the data stream. This will enable the accurate characterization of the cloud-radiation environment for initialization of the solar forecast system and development of a representative climatology.

The Contractor shall:

- Collect, analyze, validate, and report on the data collected by the instrument suite.
- Conduct data collection and QC including daily monitoring of the status of the transmitted data so that equipment failures can be quickly detected and addressed to reduce data loss.
- Correlate TSI cloud fraction measurements with the irradiance observations enabling a thorough quantified assessment of the cloud-radiation environment.
- Prepare a Monthly Data Summary Report for irradiance (global, direct, and diffuse), meteorological, and TSI monitoring systems. This will be provided in an approximately three page summary document to include but not be limited to:
 - Parameter statistics for the solar irradiance (mean, max & min)
 - Meteorological measurement means

Deliverables:

- Monthly Data Summary Reports (no draft)

Task 2.4 Ongoing Project Analysis—Forecast Performance, Identification of Significant Events, And Statistics

The goal of this task is to summarize and quantify the overall performance of the forecast system.

The Contractor shall:

- Using key metrics, determine how the solar forecast system met the objectives of the project.
- Summarize the design, implementation, operations feedback, output products, evaluation protocols and performance of the solar forecasting system.
- Analyze how the system improves the accuracy of solar forecasting, especially during times of intermittent power production (e.g. partly cloudy days).
- Make additional recommendations for PV forecasting.
- Prepare a report that documents the objectives, approach, findings, and additional recommendations for PV forecasting. The report shall include but not be limited to:
 - Sections on the design, implementation
 - Operations feedback
 - Output products
 - Evaluation protocols and performance of the solar forecasting system. The key metric will be how the system improves the accuracy of solar forecasting, especially during times of intermittent power production (e.g. partly cloudy days).
- Participate in CPR activities as per Task 1.2.

Deliverables:

- PV Forecasting Report
- 1st CPR Report

Task 3.0 SOLAR FORECAST SYSTEM

The goal of this task is to integrate multiple forecasting inputs into a forecasting system.

Task 3.1 Intra-Hour Forecasts

The goal of this task is to setup intra-hour solar forecasts for the Henderson, Nevada USRE plant.

The Contractor shall:

- Setup the following intra-hour forecasts for 1 second PV output with 30 second updates:
 - Clear sky model
 - 24 hour and 1 hour persistence forecasts and numerical weather model forecast (as a baseline)
 - Deterministic and probabilistic TSI forecasts
- Prepare a memo which briefly describes the setup and intra-hour forecasts setup in this task.

Deliverables:

- Intra-hour Forecast Memo (no draft)

Task 3.2 Setup Satellite Forecasts

The goal of this task is to setup intra-hour and hour-ahead solar forecasts for the Henderson, Nevada USRE plant.

The Contractor shall

- Prepare and provide high-resolution (~1kilometer [km]) and medium resolution (10 km) cloud motion forecasts for the area surrounding the project location throughout the project's evaluation period. The forecast will go from a few minutes ahead up to 5 hours ahead.
- Evaluate how cloud motion forecasts can be improved by using real time irradiance feedback from the project site.
- Prepare and provide a technical report describing high- and medium-resolution forecast data.
- Prepare and provide a technical report of the results of forecast evaluations.

Deliverables:

- Resolution Forecast Data Report (no draft)
- Forecast Evaluations Report (no draft)

Task 3.3 Setup NWP Component of the Forecast System

The goal of this task is to setup intra-hour, hour-ahead, and day-ahead solar forecasts for the Henderson, Nevada USRE plant.

The Contractor shall

- Configure, implement and test an ensemble-based NWP solar irradiance forecasting tool for the Henderson, Nevada USRE plant.

- Include both a rapid update cycle and a standard cycle component.
- Input cloud distribution data from satellite and ground based sensors into the rapid update cycle system.
- Use the NWP system to generate solar irradiance forecasts for the Henderson, Nevada USRE plant.
- Prepare and provide a report describing the procedures for each forecast method in Tasks 3.1-3.3.
- Participate in CPR activities as per Task 1.2

Deliverables:

- Solar Forecasting Procedure Report
- 2nd CPR Report

Task 4.0 CONDUCT DATA ASSIMILATION AND OPTIMIZATION TO DERIVE BEST MIX OF FORECAST PRODUCTS

The goal of this task is to evaluate the add-on value of sky imagery for intra-hour solar forecasting with satellite and/or numerical weather models.

Task 4.1 Configure, Implement and Test Methods to Integrate Sky Tracker and NWP Forecasting Tools

The goal of this task is to evaluate the add-on value of sky imagery for intra-hour solar forecasting with NWP.

The Contractor shall:

- Configure statistical models to link sky images from ground and NWP
- Evaluate reduction in intra-hour forecast errors across seasons and weather patterns
- Prepare a memo which briefly describes the statistical model configuration and error reduction evaluations for integrated sky tracker and NWP forecasting tools.

Deliverables:

- Sky Tracker Integration Memo (no draft)

Task 4.2 Configure, Implement and Test Methods to Integrate Satellite Cloud Vector and NWP Forecasting Tools

The goal of this task is to evaluate the add-on value of satellite imagery for 1-6 hour look-ahead solar forecasting with NWP.

The Contractor shall:

- Configure statistical models to link satellite images and numerical weather prediction
- Evaluate reduction in hour-ahead forecast errors across seasons and weather patterns
- Prepare a memo which briefly describes the statistical model configuration and error reduction evaluations for integrated satellite cloud vector and NWP forecasting tools.

Deliverables:

- Satellite Cloud Vector Integration Memo (no draft)

Task 4.3 Produce and Evaluate Integrated Forecasts

The goal of this task is to configure and implement an integrated forecast system that takes advantage of the synergies identified in Tasks 4.1, 4.2 and 4.3.

The Contractor shall:

- Use this integrated system to generate forecasts for time periods extending from a few minutes ahead to 2 days ahead for the Henderson, Nevada USRE plant for an evaluation period for which a complete set of quality controlled irradiance data is available from the Henderson, Nevada facility.
- Evaluate the forecasts using solar irradiance data from the Henderson, Nevada plant for the selected evaluation period.
- Compare the performance of the integrated forecast system to the performance of the individual methods for all look ahead time periods from a few minutes ahead to 2 days ahead.
- Prepare a report describing improvements in forecast accuracy for each method.

Deliverables:

- Solar Forecast Accuracy Report

Task 5.0 TECHNOLOGY TRANSFER ACTIVITIES

The goal of this task is to configure a plan to make the knowledge gained, experimental results and lessons learned available to key decision-makers.

The Contractor shall:

- Prepare a Technology Transfer Plan. The plan shall explain how the knowledge gained in this project will be made available to the public and indicate the intended use and users of project results. The level of detail expected is least for research-related projects and highest for demonstration projects. Key elements from this report shall be included in the Final Report for this project.
- Conduct technology transfer activities in accordance with the Technology Transfer Plan. These activities shall be reported in the Monthly Progress Reports.

Deliverables:

- Technology Transfer Plan