

Research Topic Area for Docket no.12-EPIC-01	Description
LiDAR testing	Testing of forward looking long range LIDAR equipment for feasibility in specific wind regime areas. Test to include determining the effectiveness in the use of the CAISO grid operations if units can only provide wind change information in the 30-60 minute range.
Fleet optimization to meet flexible capacity and capability requirements	Develop a method to optimize the fleet make-up to meet the fleet capability and capacity requirements. Objective: Optimize the set of resources mix to minimize capital and variable costs over 10, 20, 30 year time horizons, subject to energy balance requirements, reserve requirements, load following requirements, emission limitations. Resources that can be used to satisfy flexibility needs include conventional resource, demand response, energy Storage
System inertia and frequency response monitoring system	This project aims to equip CAISO operations with methodologies and prototype tools for real-time monitoring of the available level of frequency response and system inertia. It will quantify reliability thresholds for frequency response and inertia in the CAISO and WECC systems. It will also propose a framework for incorporating frequency response and inertia limits into the CAISO generation commitment and dispatch procedures. Finally the project will evaluate the potential for non-traditional means of providing frequency response and system inertia in the CAISO system.
Wide-Area Energy Management System	<p>The study will provide answers to the following questions:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Are the selected energy storage devices (ESDs) capable of providing the required services as expected?</li> <li><input type="checkbox"/> How much fast regulating ESD capacity is needed for a given regulation/load-following signal?</li> <li><input type="checkbox"/> How should these services be shared between CAISO and BPA? The study will consider system-wide congestion limitations.</li> <li><input type="checkbox"/> How should multiple services be provided to multiple markets, and what are the costs/benefits of doing so.</li> <li><input type="checkbox"/> What are the benefits gained by CAISO and BPA and possibly by other BAs in the WECC system?</li> <li>• <input type="checkbox"/> What are the operational changes required to implement such a system?</li> </ul>
Cost-effective metering and telemetry solutions	Alternative solutions for telemetry and revenue metering including sub-metering to reduce costs to enable monitoring to ensure reliability, improve forecasting accuracy, and enable ISO market participation for distributed energy resources including aggregation models.
Vehicle-to-Grid demonstration	Demonstrate the technology that enables demand side resources (electric vehicles, customer side storage, and demand response) can provide CAISO flexible capacity meeting ancillary service requirements cost-effectively.

	<p>Holistically analyze and perform studies on what is needed in the management and optimization of these resources (such as with EV charging infrastructure) to take advantage fully participating in all markets.</p> <p>Further stakeholders (including utilities, CAISO and policy makers) understanding of electric vehicle reliability impacts, visibility needs, approach to participation in the ISO markets, and interest and capability for participation.</p>
Synchrophasor applications research	<p>Potential areas of research include advancement of advanced applications for small signal analysis, dynamic model validation, voltage sensitivity analysis, phase angle difference dynamic limits, event playback, state estimate utilization of Synchrophasor data, nomogram validation.</p>
Price responsive demand pilot	<p>Perform demonstration of technologies that enable consumers to base their power usage decisions on a grid state index. Seeks to connect wholesale and retail markets by enabling end-use consumer devices to respond to system conditions.</p> <p>Perform studies on demand elasticity to determine effect of price responsiveness to support development of the modeling of it.</p> <p>Develop and define use cases for various grid (distribution and transmission) price response scenarios.</p>
DER penetration data sharing and location mapping	<p>Establishment of a centralized database to collect, and make publicly available, Distributed Energy Resource (DER) penetration level data within the state of California. The database, at a minimum, should include type of DER , total installed generating capacity aggregated to zip code, zip code translation to distribution substation location and ISO subLAP.</p> <p>Similar to California Solar Initiative database, it would be maintained by a specific regulatory agency and would require a process by which IOUs would be required to, or POUs would voluntarily, provide data updates.</p> <p>Additionally, a separate or separately secured portion of the database should collect and provide historical production data, aggregated by zip code, in 15 minute intervals refreshed on a daily basis. This data would be securely made available to specific regulatory agencies (i.e. CPUC, CEC, CAISO) for their use in forecasting, reporting, or studies.</p>
Dynamic thermal line rating assessment	<p>Evaluate what lines would most benefit from the application of dynamic ratings and what is the cost benefit. Public benefit for increasing transmission capacity for renewable generation and adjustments for extreme conditions to not exceed true capacity to avoid outages.</p>
Identification of meteorological parameters that	<p>Identify forecasting techniques to determine aggregated net (load minus solar generation) on distribution feeders and in balancing areas and integration of these parameters into machine learning models to forecast</p>

determine aggregate net load	net load hours to days ahead.
Forecast integration into CAISO operations	Forecast integration into CAISO operations including software development for identification of past analogs to current forecasts, metrics for selection of analogs, and operator training.
Improved day-ahead forecasting through numerical weather models with a focus on marine layer clouds.	Advanced algorithms to ingest satellite and ground measurements into such models and advanced modeling parameterizations for clouds and the boundary layer should be applied. Of specific interests are ensemble forecasts integrated with machine learning tools to optimize dynamic selection of forecast models based on meteorological conditions