UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corp.	**)** **)** **)**	**Docket No. IN14-10-000**

MOTION TO AMEND STIPULATION AND CONSENT AGREEMENT

The California Independent System Operator Corporation ("CAISO") respectfully submits this motion to amend the Stipulation and Consent Agreement ("Consent Agreement" or "Agreement") approved by the Commission on November 28, 2014.[1] The CAISO requests that the Commission amend the Consent Agreement to remove the requirement that the CAISO implement the Contingency Modeling Enhancements ("CME") project. As explained below, this amendment is in the public interest because the circumstances that drove the need for CME no longer exist, and the CAISO has fully complied with all other aspects of the Consent Agreement, including implementing all of the other enhancements in the Agreement at a cost that has substantially exceeded the total amount the Agreement required the CAISO to spend on all such enhancements. The CAISO has been advised by the other signatories to the Consent Agreement—the Commission's Office of Enforcement ("Enforcement") and the North American Electric Reliability Corporation ("NERC")—that they do not oppose this motion.

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[1] *California Independent System Operator Corp*., 149 FERC ¶ 61,189 (2014) ("Settlement Order"). The CAISO submits this motion pursuant to Rules 212 Commission's Rules of Practice and Procedure, 18 C.F.R. §§ 385.212. Capitalized terms not otherwise defined herein have the meanings set forth in the CAISO tariff, and references to specific sections, articles, and appendices are references to sections, articles, and appendices in the current CAISO tariff and as revised or proposed in this filing, unless otherwise indicated.

I. Background

A. 2014 CAISO Settlement

To conclude Enforcement and NERC's investigation into the CAISO's role in the September 8, 2011 Pacific Southwest blackout ("September 8 Event"), the CAISO entered into a Consent Agreement with Enforcement and NERC. Under the Consent Agreement, the CAISO agreed to pay a civil penalty of $6 million, $2 million in the form of a cash fine, and $4 million to be "invested in reliability enhancement measures that go beyond mitigation of the violations."[2] The Commission approved the Consent Agreement among the CAISO, FERC, and NERC on November 28, 2014.[3]

The enhancements included five specified projects, without dollar value attributed to any one project.[4] The projects were:

1. Enhance the full network model for the CAISO's day-ahead application, including a fully looped representation of the entire Western Interconnection.[5]
2. Enhance and expand the CAISO's real-time contingency analysis ("RTCA") to account for the external model changes so that operators are aware of the impact of any external contingencies to CAISO's transmission operations as well as the impact on external transmission systems of contingencies on CAISO's system, and expand the RTCA user interface to allow for better operator situational awareness with alarms, sorting, and historical capability.

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2 Settlement Order at 1.

3 Settlement Order.

4 Consent Agreement at 7 *et seq.*

5 The improved model was required to (i) reduce compensating injections associated with loop flows; (ii) enable expanded flow-based and contract-based congestion management and energy balancing WECC-wide both in day-ahead and real-time; (iii) explicitly model high voltage direct current links; and (iv) enable better outage and day-ahead analysis.

3. Enhance the CAISO's Energy Management System ("EMS") and Supervisory Control and Data Acquisition systems by adding detailed network models for neighboring transmission operators.[6]
4. Implement the Contingency Modeling Enhancement ("CME") Project to ensure that the CAISO market procures the appropriate resources that have the correct characteristics to ensure the ability to recover from a contingency and be ready for the next N-1 contingency as soon as possible but no longer than 30 minutes.
5. Continue working with the Reliability Coordinator ("RC") and other transmission operators on the RC's efforts to establish a mandatory periodic design review process for key Remedial Action Schemes ("RASs") within the Pacific Southwest region and eventually for the entire Western Interconnection.[7]

The CAISO agreed to provide the Commission and NERC "with satisfactory evidence, as determined by Office of Enforcement and NERC, of the completion of the Reliability Enhancements."[8] The Consent Agreement noted that the CAISO had already provided satisfactory evidence that its investments in the enhancements had already exceeded $4 million.[9]

B. CAISO Compliance with Settlement

Since 2014, the CAISO has implemented all of the enhancements listed in the Consent Agreement, with the exception of CME. Not including the costs for CME, the

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6 IID, NV Energy, APS/Yuma, Western Area Power Administration Lower Colorado and Sierra Nevada regions, Los Angeles Department of Water and Power, Sacramento Municipal Utility District, Modesto Irrigation District and Turlock Irrigation District

7 *Id*.

8 *Id*. at 15.

9 *Id*.

CAISO has to date spent approximately $4.9M on those enhancements. The CAISO also has spent over $1.6M developing CME software. The following table lists the CAISO's enhancements expenditures pursuant to the Consent Agreement:[10]

Full Network Model	$3,720,876.04
RTCA	$1,169,124.19
CME	$1,644,102.53
Total	**$6,534,102.76**
Total Excluding CME	$4,890,000.23

The CAISO also completed the EMS/SCADA and RC enhancements, but the expenditures for those efforts were less substantial and not tracked. As described below, the CAISO's transmission planning process also approved and has resulted in the construction of approximately $350 million in transmission upgrades to address the voltage instability issues in southern California that contributed to the September 8 Event.

C. History of CME

The CAISO first proposed CME as a concept in a 2013 stakeholder initiative.[11] As the Consent Agreement describes, CME was intended to "ensure that the CAISO market procures the appropriate resources that have the correct characteristics to ensure the ability to recover from a contingency and be ready for the next N-1 contingency as soon as possible but no longer than 30 minutes."[12] After a real-time transmission or major generation outage, flows on other transmission paths may begin

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10 The expenditures consist of vendor costs ($5.2 million) and internal labor ($1.3 million).

11 CAISO, CME Issue Paper, (March 26, 2013) http://www.caiso.com/InitiativeDocuments/IssuePaper-ContingecyModelingEnhancements.pdf.

12 Consent Agreement at 14. The Consent Agreement does not further describe CME.

to exceed their system operating limits ("SOLs"). According to NERC and WECC standards, following a contingency the CAISO may be required in some cases to address the next potential pre-contingency overload within 30 minutes.[13] In many instances, the CAISO's standard market systems are able to account for and meet such contingencies. There have, however, historically been some constrained areas within the CAISO footprint where the number of fast-starting resources could be insufficient to meet this objective, without the CAISO pre-committing specific resources that take longer to start or ramp up. To address these circumstances, the CAISO has generally used exceptional dispatch and minimum online capacity constraints ("MOCs"). These tools pre-commit capacity in constrained areas so the CAISO has available energy in the event of a contingency. If adopted, CME would do the same through specific market awards for "corrective capacity" in the day-ahead and real-time markets.

The CAISO simulated CME, using the software it had developed, during the stakeholder initiative. Analysis of the simulation demonstrated that CME was able to procure capacity more efficiently than MOCs, resulting in some potential production cost savings.[14] The analysis also showed that on typical stressed days, CME constraints rarely bound, meaning that the market optimization did not need to procure additional capacity for most contingencies.

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13 Under current NERC/WECC requirements, this is required for any SOL that is also an IROL or for SOLs for transmission facilities for which the post-contingency emergency limit is 30 minutes. As discussed below, when the CAISO proposed CME in 2013 there was an additional WECC regional standard that imposed a 30-minute recovery obligation at transmission path level, which is no longer in effect.

14 In other words, CME procured corrective capacity somewhat less frequently than the CAISO otherwise would through MOCs and exceptional dispatch, which could be viewed as more efficient dispatch process.

Stakeholders generally supported CME; however some stakeholders opposed it because they believed that its efficiency benefits would be negligible, but its implementation costs and complexity would be very high.[15]

II. Amending the Consent Agreement is in the Public Interest

Although the CAISO has not abandoned the possibility of implementing CME in the future, the CAISO believes imposing it as a requirement in the Consent Agreement is no longer warranted due to changed circumstances that have greatly reduced its value relative to the substantial costs and stakeholder resources that would be required to implement it. Importantly, without including CME, the CAISO has already spent substantially more on the other enhancements set forth in the Agreement than the $4 million credit it received. Because the costs of implementing CME substantially outweigh any currently foreseeable reliability benefits, the CAISO should not be required to implement the project for the sole purpose of satisfying the specific reference to it in the Consent Agreement. Although it is possible circumstances may change such that implementing CME may be warranted in the future, this is far from certain now. Decoupling this decision from the CAISO's settlement obligations is therefore in the public interest.[16]

The CAISO explains each assertion below and discusses the other important enhancements it has completed in recent years.

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15 http://www.caiso.com/Documents/Decision_ContingencyModelingEnhancements-StakeholderMatrix-Dec2017.pdf.

16 This motion does not seek an opinion on the justness and reasonableness of CME. If the CAISO seeks to implement CME in the future, it will present that question to the Commission pursuant to Section 205 of the Federal Power Act.

A. The Circumstances that Drove the Need for CME at the Time of the Settlement No Longer Exist

At the time of the settlement, the intent of CME was to have a market mechanism to procure additional generating capacity to bring transmission line flows within SOLs within thirty minutes, as required by WECC and NERC reliability standards. Specifically, CME originally was conceived to help the CAISO comply with the regional reliability standard TOP-007-WECC-1a. This standard identified a single, pre-determined transfer capability value for an entire transmission path composed of multiple individual lines and facilities, which, if operated within, was intended to provide for reliable operation by preventing a predetermined limiting contingency from resulting in an exceedance of SOLs.[17] The CAISO planned to use CME as a preventive-corrective constraint that would allow its market systems to select and procure capacity in advance that would be sufficient to bring path flows back within their limits within the thirty-minute period required by TOP-007-WECC-1a. Without CME, the CAISO uses Minimum On-Line Constraints ("MOCs") and exceptional dispatch to procure such capacity in advance. These tools can be less efficient because they rely on engineering and operator discretion instead of the market optimization, and thus may procure capacity more frequently than the market would.[18] CME thus potentially could be used to reduce the CAISO's use of MOCs, though MOCs likely would still be appropriate for certain contingencies.

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17 NERC, Supplemental Information for Petition for Approval of Retirement of Regional Reliability Standard, Docket No. RM16-10-000, 1-2 (Nov. 16, 2016).

18 CAISO Market Surveillance Committee, Opinion on CME at 13 *et seq.*, (Dec. 1, 2017), http://www.caiso.com/Documents/MSCFinalOpinionon ContingencyModelingEnhancements_-_Dec1_2017.pdf.

In 2016, NERC and WECC concluded that TOP-007-WECC-1a was anachronistic, and retired the standard. "With the development of advanced applications for Real-time analysis," NERC and WECC found that "the paradigm upon which TOP-007-WECC-1a is based no longer aligns with current operating practices nor does it provide an optimal framework for reliably operating the Bulk-Power System."[19] NERC and WECC retired TOP-007-WECC-1a "to shift away from the path-centric paradigm."[20]

As a result of the improvements in real-time analysis, the shift away from path-centric paradigms, and the retirement of TOP-007-WECC-1a, there are now far fewer circumstances under which CME may potentially be deployed. When TOP-007-WECC-1a was in place, there were five major constraints for which CAISO had planned to use CME on an ongoing basis. Today there is only one potential constraint for which CME might be used, and that constraint exists only at certain times of year during certain outage conditions, which limits the efficiency gains that could be realized by using CME rather than continuing to use a MOC to pre-commit necessary units.

Until recently, the CAISO had still intended to use CME in the near term to address one potentially significant constraint—a voltage stability interconnection reliability operating limit ("IROL") in Southern California. This IROL, however, was recently eliminated as an ongoing operational constraint as a result of extensive system upgrades over the last several years that focused on enhancing voltage support in that region. Since 2011, SDG&E and SCE have constructed over ten synchronous

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19 *Id.* at 2.

20 *Id.*

condensers,[21] which automatically generate or absorb reactive power as needed to adjust the grid's voltage. SDG&E has also installed a phase-shifting transformer at the Imperial Valley substation, which helps maintain reliability of the system against any contingency.[22] These enhancements represent approximately $350 million in investment in the southern California system. They were identified and approved through the CAISO's annual transmission planning process, and have significantly increased voltage stability limits in Southern California and thereby currently eliminated the need for the voltage stability IROL. In plain terms, the Southern California transmission system is far more robust than the 2011 system.

Additionally, the CAISO's Southern California generation fleet is different than in 2011 or 2014. Some generators with longer start-up times and relatively slower ramping rates have retired. In their place, newer faster-starting and quicker-ramping resources have come online. The CAISO expects this trend to continue, especially as many energy storage resources are scheduled to come online over the next two years. These newer resources can respond to contingencies to restore line flows much more rapidly than the earlier fleets. As a result, the CAISO has less need to pre-commit capacity for potential contingencies in Southern California.

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21 A synchronous condenser (sometimes called a synchronous capacitor or synchronous compensator) is a device identical to a synchronous motor, whose shaft is not connected to anything, but spins freely. Its purpose is not to convert electric power to mechanical power or vice versa, but to adjust conditions on the electric power transmission grid. *See NRG Application for Certification*, Synchronous Condenser Analysis, CPUC Docket No. 15-AFC-01, at 2 (Feb. 18, 2016), *available at* https://efiling.energy.ca.gov/GetDocument.aspx?tn=210450&DocumentContentId=16801.

22 *See* Siemens, "Phase-Shifting Transformers," https://new.siemens.com/global/en/products/energy/high-voltage/transformers/phase-shifting-transformers.html. By changing the effective phase displacement between the input voltage and the output voltage of a transmission line as needed, phase shifters enforce, block and even revert power flow as well as reduce or eliminate loop flows. Phase shifters can rebalance line loading between parallel lines or network sections.

Even if the CAISO implemented CME today, it would rarely procure corrective capacity in the CAISO markets. Following the retirement of TOP-007-WECC-1a, the CAISO simulated CME as part of the CME stakeholder process. The analysis showed that even on stressed days, the CME constraints generally did not bind. In other words, CME, even on stressed days, in most instances would not procure additional capacity because generation schedules, spinning reserves, and non-spinning reserves would already suffice to restore line flows expeditiously in the event of a contingency.

B. The CAISO has Recently Implemented Additional Enhancements that Demonstrate its Ongoing Commitment to Reliability

The CAISO has recently implemented a number of other important enhancements. Although these enhancements were not contemplated by the Consent Agreement, they are consistent with its intent, and demonstrate the CAISO's ongoing commitment to enhance system reliability.

First, in 2016 the CAISO implemented its flexible ramping product to address uncertainty in the real-time markets. Rooftop solar energy can frequently cause significant changes in load patterns very quickly. The flexible ramping product procures generator ramping capability to cover those supply and load resources that increase the need for ramping capability between market intervals.[23] It also procures additional ramping capability to cover uncertainty in the net load forecast. These features enhance system reliability by ensuring the CAISO has procured sufficient generation to

[23] *See California Independent System Operator Corp.*, 156 FERC ¶ 61,226 (2016). Ramping capability is a resource's ability to move from one energy output to a higher (upward ramp) or lower (downward ramp) energy output. Flexible ramping capability is a resource's ability to rapidly change its output to respond to a change in forecasted net load.

support load, voltage, and frequency in between market intervals. CAISO expenditures for this product totaled $1,632,676.99.

Second, in 2018 the CAISO added remedial action schemes and generator contingencies into its market optimization. The Commission approved this enhancement, finding it would "more closely align market dispatch and prices with actual operations, and "will be beneficial by reducing reliance on exceptional dispatch."[24] Remedial action schemes—also known as special protection systems or direct transfer trips—automatically disconnect generators or load in the event of a contingency that would otherwise cause system overloads. Previously, the CAISO's LMPs only accounted for the potential loss of *transmission* elements, thereby treating congestion from each generator equally even if a remedial action scheme would trip some generation offline in the event of a contingency. Based on engineering analysis and outage history, the CAISO selected specific generator contingencies and remedial action schemes to incorporate in its market models. LMPs now account for whether a generator's output will require more or less transmission capacity in the event of generation loss, thereby improving market dispatch, decreasing out-of-market actions, and appropriately pricing each generator's contribution to congestion in the markets. CAISO expenditures for this enhancement totaled $1,002,133.32.

Third, in 2019 the CAISO completed one of its most ambitious enhancements by upgrading its EMS, the operating technology the CAISO uses to manage the power grid.[25] The EMS upgrade followed five years of study, competitive bidding, design, and

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[24] California Independent System Operator Corp., 166 FERC 61,158 at P 11 (2019).

[25] http://www.caiso.com/Documents/CaliforniaISOLaunchestheMostAdvancedGridOperatingSystem.pdf.

implementation. The EMS upgrade comprehensively improves grid power flow accuracy, enhances operators' situational awareness, offers operational flexibility with frequent model changes, and upgrades critical infrastructure protection. CAISO expenditures for the EMS upgrade totaled $13,798,965.92.

Finally, in late 2014 the CAISO launched the Energy Imbalance Market ("EIM"), which gives system operators real-time visibility across neighboring grids. The EIM expands the CAISO's real-time visibility and optimization across the West, thereby lowering costs and greatly enhancing reliability and resiliency. Ten utilities outside of the CAISO Balancing Authority Area already have already joined the EIM, and ten more will join by 2022.[26]

C. The Costs to Implement CME Currently Outweigh its Potential Benefits

Although the CAISO has developed the market optimization software for CME, substantial additional work and expense would be required, both by the CAISO and its customers, to implement it.

Most significantly, implementing CME would require a large amount of software development work relating to the CAISO's post-market settlement processes. This work involves modifying numerous charge codes that the CAISO's settlement systems use to calculate and then collect and disburse market revenues and charges. The CAISO estimates this development work alone would require approximately 1,430 labor hours to complete.

[26] https://www.westerneim.com/Pages/About/default.aspx.

Scheduling coordinators that interact with the CAISO also would need to implement their own post-market settlement process enhancements to adopt CME. For each charge code the CAISO modifies, scheduling coordinators must modify their shadow settlement systems to reflect each of the CAISO's changes. Development, testing, and implementation requires significant time and investment. The CAISO also would need to train scheduling coordinators on CME changes, and then simulate CME with market participants. Additionally, the CAISO has not developed the tariff revisions to implement CME with stakeholders, and would have to file those tariff revisions with FERC for approval.

Although this additional effort and expense required to implement CME potentially would be justified if CME were expected to have a broader application, it is not currently warranted given the very narrow potential set of circumstances under which the technology is expected to be used. If circumstances change such that there are more contingencies/constraints for which CME may be useful, then the CAISO may decide to move forward with that effort at that time.

D. The CAISO has Satisfied the Intent of the Consent Agreement

The fundamental purpose for the $4 million credit in the Consent Agreement was to enhance reliability by requiring CAISO to spend significant amounts on meaningful enhancements to its system and capabilities. The CAISO has more than met that objective by: (1) implementing all of the other projects identified in the Consent Agreement (costing in excess of $4 million); (2) spending many millions more on the other enhancements described in Section III.B above; and (3) using its transmission planning function to promote, approve, and oversee the deployment of $350 million in

extensive system upgrades in Southern California that have provided voltage support and enhanced voltage stability in the region. Through all of these efforts, the system is now far more resilient than it was on September 8, 2011, and less susceptible to the contingencies CME would address. Because the Consent Agreement has achieved its fundamental purpose and changed circumstances have greatly diminished the potential value of CME, this last requirement should be removed from the agreement and CAISO should be found to have completed its settlement obligations.

III. Conclusion

For the reasons stated above, the Commission should approve the CAISO's motion to amend and find that amending the Consent Agreement is in the public interest.

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Dated: September 17, 2020

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon all of the parties listed on the official service list for the above-referenced proceeding, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom, CA this 17th of September, 2020.

/s/ Jacqueline Meredith

Jacqueline Meredith