UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	**)**	**Docket No. ER06-615-___**

MOTION OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION FOR EXTENSION OF TIME TO IMPLEMENT CONVERGENCE BIDDING

The California Independent System Operator Corporation ("ISO")[1] submits this motion[2] for an extension of the time for implementing its convergence bidding design in compliance with the Commission's September 21, 2006, order in the above-referenced proceeding.[3] In the September 2006 Order, the Commission directed the ISO to implement convergence bidding within twelve months of the start of the new ISO market.[4] For the reasons explained below, the ISO respectfully requests a ten-month extension of time to implement convergence bidding by February 1, 2011, in order to provide sufficient time for

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[1] The ISO is also sometimes referred to as the CAISO. Capitalized terms not otherwise defined herein have the meanings set forth in the Master Definitions Supplement, Appendix A to the ISO tariff.

[2] The ISO submits this motion pursuant to Rules 212 and 2008(a) of the Commission's Rules of Practice and Procedure, 18 C.F.R. §§ 385.212, 385.2008(a).

[3] *California Independent System Operator Corp.*, 116 FERC ¶ 61,274 (2006) ("September 2006 Order"). Convergence bidding is "a market feature that involves the submission of bids to buy or sell energy in the day-ahead market that will ultimately not be consumed or produced in real time, which results in the convergence of day-ahead and real-time prices. Convergence bids represent financial transactions, are submitted like other bids, and are recognized by system operators as not being physical." *Id.* at P 430 n.198.

[4] *Id.* at P 452. The new ISO market went into effect on March 31, 2009, for the day-ahead market for the April 1, 2009, trading day. The new ISO market is also sometimes referred to as the Market Redesign and Technology Upgrade ("MRTU"). The date on which the new ISO market went into effect is sometimes called the "go-live" or "start-up" date.

the ISO and market participants to develop and test the software and the many interrelated business applications.

I. Introduction and Summary of Argument

The ISO wishes to assure the Commission that it does not submit this extension request lightly. The ISO only makes this request after concluding that an extended implementation schedule is unavoidable in order for the ISO and market participants to develop, test, and implement the extensive software modifications needed to implement a convergence bidding market feature in a safe and reliable manner. The ISO concedes that the need to extend the implementation date of convergence bidding was caused in part by the ISO's decisions made during early 2009 to maintain all software development resources for the purpose of ensuring that the ISO's new market design could be implemented by March 31, 2009, without any further delay rather than committing certain of these resources to developing convergence bidding software. These same resources remained dedicated by necessity to the go-live effort until several months after market start-up. As the Commission is aware, the ISO's original proposed implementation date of the new market – then referred to as MRTU – as filed in February 2006, was October 2007. Following the filing of the original MRTU tariff, the ISO extended the target implementation date a number of times. By the end of 2008, the ISO realized it must do everything in its power to ensure that the new market would be implemented on March 31, 2009 without any further delay. Accordingly, all resources were dedicated to that goal, which the ISO achieved.

The ISO recognizes that convergence bidding has proven to be a valuable market design feature in other wholesale electricity markets, and the ISO has a strong desire to implement it as soon as practicable so that the benefits of convergence bidding can be realized in the new ISO market. Those benefits include the ability to submit virtual bids that tend to reduce any systematic differences between day-ahead and real-time prices, thus minimizing incentives for under- or over-scheduling of physical demand in the day-ahead and allowing market participants to manage their risk of price exposure. Convergence bidding also has proven to contribute to market liquidity which, among other things, helps discipline the market power of physical suppliers.

The ISO is pleased to report that there has also been substantial convergence concerning the design elements of the convergence bidding policy. As soon as practicable after realizing the successful implementation of the new market, the ISO resumed its years-long stakeholder process on convergence bidding policy issues. In a matter of months, and with the benefit of actual market data, the ISO was able to finalize its convergence bidding design policy. Specifically, the ISO is proposing a nodal convergence bidding design with strong stakeholder support, a result that seemed highly unlikely a year ago. The ISO Board of Governors ("Board"), at its most recent meeting held in October 2009, approved the design of convergence bidding. Pursuant to the Board's authorization, the ISO is submitting, simultaneously with the filing of the instant

motion, a request for Commission approval of the ISO's convergence bidding design policy.[5]

The ISO expects all issues on the design of the ISO's convergence bidding feature to be resolved in the first half of 2010. The drivers of the modified convergence bidding implementation schedule presented in this motion are the realities of developing and testing of a complex software package informed by the ISO's experience in implementing MRTU. As explained below, that process is scheduled to take a total of eighteen months, which reflects the complexity of the software design process, the need for testing and market simulation, and the lessons learned in connection with the ISO's new market software. Moreover, the eighteen-month schedule is consistent with industry practice for this type of advanced and customized software design.

The ISO acknowledges the importance of the Commission's directives in the September 2006 Order, which reflect the high priority that the Commission and many market participants have placed on expeditious implementation of convergence bidding. The development and implementation schedule laid out in this pleading represents the ISO's commitment to implement by February 1, 2011. Although it is unlikely the ISO will be able to accelerate this schedule, the ISO will continue to examine whether it can and will make any adjustments to this schedule by the end of 2009. But the ISO is committed to implementing

[5] The ISO intends to file the convergence bidding tariff language in the First Quarter of 2010 after holding a robust tariff stakeholder process that will include two rounds of stakeholder review and comment. The ISO also plans to incorporate any guidance from the Commission in response to its convergence bidding design filing and to provide stakeholders with the opportunity to review and comment on any necessary changes.

convergence bidding no later than February 1, 2011. As noted above, this schedule is informed by the ISO's prior experience in connection with implementing the ISO's new market design: the ISO does not want to repeat the experience of a series of adjustments to implementation schedules based on unrealistically optimistic estimates of when complex software packages will be fully tested and ready for deployment.

In support of this request, the ISO submits declarations from the following ISO officers and key personnel working on the development of convergence bidding: Steve Berberich, the Vice President of Corporate Services for the ISO; Janet Morris, Director of the Program Office for the ISO; Khaled Abdul-Rahman, Principal, Power Systems Technology Architecture & Development for the ISO; and Margaret Miller, Senior Market Design and Policy Specialist for the ISO. These officers and key personnel explain, among other things, that the ISO has already devoted substantial resources to the development of convergence bidding and that the ISO has a feasible schedule for implementing convergence bidding following the required software development and testing process. For the reasons explained in this motion and the declarations, the extension of time to implement convergence bidding requested by the ISO is appropriate.

II. Request for Extension of Time

The Commission will grant a request for an extension of time to comply with a prior Commission directive upon a showing that good cause exists to grant

the requested extension.[6] For the reasons explained below, such good cause exists here.

A. Background

In its orders on the conceptual design of the new ISO market, the Commission directed the ISO to pursue a convergence bidding feature. The Commission directed the ISO to either: (1) submit tariff sheets to implement convergence bidding simultaneously with the implementation of the day-ahead market; or (2) if it did not believe the simultaneous implementation to be feasible, explain why and inform the Commission of a date when it would be feasible to implement convergence bidding.[7] In its February 2006 tariff filing and related pleadings addressing the ISO tariff that implements the new ISO market, the ISO explained that implementing convergence bidding on day one could substantially delay the launch of the new ISO market and noted that the challenges associated with implementing convergence bidding in the new ISO market fall into two separate but related categories: (1) the need to make critical policy determinations about the design of a convergence bidding feature; and (2) the

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[6] 18 C.F.R. § 385.2008(a); *Northeast Utilities Service Co.*, 126 FERC ¶ 61,052, at P 12 (2009) ("It is well settled that the Commission has the authority to waive its rules or regulations upon a showing of good cause. Indeed, the Commission has frequently granted extensions of time or waivers of deadlines to provide parties with additional time to comply with requirements in our orders or filing deadlines."). This "good cause" standard only applies, however, in cases where the request for an extension of time is made prior to the expiration of the period prescribed. In cases where the request for an extension of time is made after the expiration of the period prescribed, the Commission will grant the request only upon a showing of "extraordinary circumstances sufficient to justify the failure to act in a timely manner." 18 C.F.R. § 385.2008(b). The ISO is filing the instant motion approximately six months prior to the expiration of the period for implementing convergence bidding prescribed in the September 2006 Order. Therefore, the "good cause" standard rather than the "extraordinary circumstances" standard applies to this motion.

[7] *See* September 2006 Order at P 447.

challenges associated with the development, testing, and implementation of software to implement convergence bidding in addition to the software needed to implement all the other features of the ISO's new market design.[8] Consequently, the ISO proposed to implement convergence bidding as part of "Release 1A of MRTU" and indicated that the ISO's "best estimate for a date when it would be feasible to implement convergence bidding is approximately twelve months after the start of MRTU."[9]

In the September 2006 Order, the Commission found that convergence bidding "is the appropriate mechanism to address the incentive for LSEs [load serving entities] to underschedule in the day-ahead market" and that convergence bidding can provide benefits such as improving day-ahead and real-time price convergence and reducing the exercise of market power.[10] The Commission rejected the requests of some commenters to mandate inclusion of convergence bidding on day one of the new markets even if that meant delaying start-up of those markets, finding that "the harm of further delaying the substantial benefits of MRTU outweigh the potential benefits that are to be gained by implementing convergence bidding in Release 1."[11] Therefore, based

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[8] *See id.* at P 431.

[9] *Id.* at PP 430, 432. Release 1A of MRTU was a term used in 2006 to denote certain market enhancements to be developed and put into effect subsequent to the implementation of Release 1 of MRTU, *i.e.*, the new ISO market as of MRTU start-up, but prior to the full scope of market enhancements under consideration for Release 2 of MRTU, approximately three years after start-up. *See id.* at P 33. The ISO now refers to the items included in MRTU Release 1A as Markets and Performance or MAP items. This deliberate staging of the MRTU process is necessary due to the many challenges associated with developing and implementing the new market design. *Id.* at P 1373.

[10] *Id.* at PP 181, 449-51.

[11] *Id.* at P 451.

on the ISO's best estimate in 2006 of the earliest date when convergence bidding could be put into effect, the Commission directed the ISO to file tariff language to implement convergence bidding within twelve months after the effective date of Release 1 of MRTU.[12] The Commission also directed the ISO to "develop and file interim measures . . . to address the potential economic incentive for LSEs to underschedule in the day-ahead market until the successful implementation of convergence bidding has been achieved."[13] On rehearing of the September 2006 Order, the Commission clarified that, "at the latest, within 60 days prior to the one-year anniversary of Day 1 of MRTU operation, the CAISO must file tariff sheets implementing convergence bidding with a proposed effective date of that first anniversary."[14]

The ISO timely developed and filed, and the Commission approved, the interim tariff measures required by the September 2006 Order to address the potential economic incentive for LSEs to under-schedule in the day-ahead market.[15] In this regard, the Commission stated that its "goal is to prevent underscheduling from becoming persistent in the absence of convergence

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12 *Id.* at P 452.

13 *Id.*

14 *California Independent System Operator Corp.*, 119 FERC ¶ 61,076, at P 117 (2007) ("April 2007 Order"). As noted above, the ISO intends to file the convergence bidding tariff language in the First Quarter of 2010 after holding a robust tariff stakeholder process and incorporating any guidance from the Commission in response to its convergence bidding design filing. In this motion, the ISO also seeks any extension of the requirements of the April 2007 Order necessary to submit the convergence bidding tariff language on this schedule.

15 *See California Independent System Operator Corp.*, 124 FERC ¶ 61,043 (2008), *order on reh'g and compliance filing*, 125 FERC ¶ 61,339 (2008), *order on compliance filing*, 126 FERC ¶ 61,277 (2009); Letter Order, Docket Nos. ER06-615-041, *et al.* (July 2, 2009). These interim measures are contained in Section 11.24 of the ISO tariff.

bidding, and the [ISO's] proposal as accepted by the Commission accomplishes this."[16] The ISO will retain these interim measures in its tariff until convergence bidding goes into effect.[17]

B. The ISO Required All Resources, Including Software Development Resources, to be Devoted to Ensuring the Successful Launch of the New Markets

Over the past three and a half years, the ISO has worked extensively with stakeholders to develop the design for the ISO's convergence bidding market product, resulting in the convergence bidding design policy that is being submitted simultaneously with this motion. For much of those three and a half years, and especially in the months before and after market start-up, ISO and stakeholder resources were also committed to developing and ensuring the successful implementation of the new ISO market. These start-up activities necessarily diverted resources from convergence bidding, which has made it impossible for the ISO to meet the directive to implement convergence bidding by the one-year anniversary of start-up, *i.e.*, March 31, 2010.

From June 2006 through October 2008, the ISO and stakeholders engaged in extensive discussions on potential approaches to convergence bidding and related issues. This stakeholder process on convergence bidding policy is discussed in greater detail in the Declaration of Margaret Miller, Senior

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[16] *California Independent System Operator Corp.*, 125 FERC ¶ 61,339, at P 15. *See also* April 2007 Order at P 117 ("The parties have not shown or argued that the interim measures that were ordered will not serve to mitigate demand side market power until a fully developed convergence bidding program can be implemented.").

[17] The ISO recognizes that the interim measures, while beneficial, are not a perfect substitute for convergence bidding, and that "the implementation of an effective convergence bidding plan is the best measure to deal with the relevant economic incentives and market power concerns." *California Independent System Operator Corp.*, 124 FERC ¶ 61,043, at P 39.

Market Design and Policy Specialist for the ISO, provided as Attachment D to this filing. The convergence bidding stakeholder process included the following:

- Stakeholder meetings and conference calls held in June 2006, October 2006, June through September of 2007, November 2007, February 2008, May 2008, July 2008, and October 2008;
- Numerous written stakeholder comments;
- Issuance of a series of white papers on convergence bidding policy prepared by the ISO; and
- Presentations given by representatives of other independent system operators ("ISOs") and regional transmission organizations ("RTOs") regarding the convergence bidding rules and experiences of those entities.[18]

The ISO and stakeholders resolved a number of policy issues during this period including: (1) the basic characteristics of convergence bids, (2) the basic elements of the credit policy applicable to convergence bids, and (3) a proposal to address scheduling incentives regarding seller's choice contracts.[19] As of late 2008, other significant policy issues concerning the design of convergence bidding remained unresolved. The discussions at the meetings and on the conference calls revealed significant disagreements over a number of issues, most notably the fundamental issue of the granularity of convergence bidding – whether the bidding should be allowed only at the zonal or at the nodal level –

[18] Materials related to the convergence bidding stakeholder process are posted on the ISO's website at: http://www.caiso.com/1807/1807996f7020.html.

[19] "Straw Proposal for the Design of Convergence Bidding" (ISO document dated July 2, 2009) at 5 ("July 2009 Straw Proposal"). The July 2009 Straw Proposal is available on the ISO's website at: http://www.caiso.com/23df/23dfd29225fb0.pdf. A "seller's choice" contract allows a seller of power to designate a point of delivery within the CAISO Balancing Authority Area. *California Independent System Operator Corp.*, 111 FERC ¶ 61,138, at P 1 n.2 (2005).

and the allocation of Bid Cost Recovery uplift charges to convergence bidders.[20] The template for written stakeholder comments that the ISO circulated after the October 2008 meeting provides an overview of significant policy issues open at that time. The template included ten questions that still needed to be addressed regarding convergence bidding, including the possible need for Resource IDs for convergence bidding, and cost allocation for Integrated Forward Market, Residual Unit Commitment, and Real-Time Market Bid Cost Recovery uplift charges.[21]

As explained by Ms. Miller in her Declaration, in 2007, however, the ISO determined and informed stakeholders that the fundamental decision of whether convergence bidding should be designed on a zonal or a nodal level would be deferred until after implementation of the new ISO market. This deferral would provide the ISO and stakeholders with the opportunity to review actual market data that would provide insights into market outcomes under the new software and market rules. Specifically, the market data would provide information about price divergence between the day-ahead and real-time markets, which would inform the fundamental decision of whether convergence bidding in the ISO should be designed on a zonal or a nodal basis.[22] Subsequent to 2007, the ISO

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[20] July 2009 Straw Proposal at 5.

[21] This template for written stakeholder comments is available on the ISO's website at: http://www.caiso.com/2068/2068b4fa43730.doc.

[22] *See* ISO white paper entitled "Update on the Design for Convergence Bidding" (Nov. 7, 2007) ("The CAISO will defer the policy decision on nodal or LAP [load aggregation point]-level virtual bidding until the end of August, 2008, which should allow additional time for stakeholder consideration on this granularity issue as well as for observing five months of the redesigned LMP markets in operation."); ISO presentation to stakeholders entitled "Update on the Design for Convergence Bidding" (Nov. 14, 2007), at 3 ("The CAISO will defer the policy decision on nodal

reiterated in the stakeholder process that the critically important zonal-versus-nodal decision would have to be made after the new ISO market was implemented.[23] The ISO initial design of the convergence bidding software was intended to be configurable to accommodate convergence bidding at either the nodal or the zonal level so that the decision to defer this policy decision would not affect the software development timeline.

Although stakeholders were long aware that a final decision on the convergence bidding design policy could not be made until sometime after start-up, the ISO had intended to resolve the remaining policy issues prior to start-up and continued to engage with stakeholders until the October 2008 stakeholder meeting. But the October 2008 stakeholder meeting proved to be the last such meeting prior to go-live, though it was not intended to be the last meeting. Both the stakeholders and the ISO became fully occupied with the effort to ensure the launch of the new market, which, as explained further below, was targeted for implementation on January 31, 2009 at the time of the October 2008 meeting and was later subject to adjusted target dates of March 1 and then of March 31, 2009. The ISO's need to devote resources to the go-live effort consumed the organization's resources for several months before and after go-live. The ISO was finally able to resume the stakeholder process on convergence bidding

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or LAP-level virtual bidding [in order to] [b]uild scalable functionality[,] [r]eview market outcomes[, and] [s]eek MSC guidance."). These materials are available on the ISO's website at: http://www.caiso.com/2441/2441ebb749910.html.

[23] *See, e.g.*, ISO presentation to stakeholders entitled "Finalizing Convergence Bidding Policy Development" (Oct. 16, 2008), at 2 ("Policy for the granularity of virtual bids will be determined after the MRTU markets are running."). This presentation is available on the ISO's website at: http://www.caiso.com/2060/2060e691180e0.pdf.

policy in July, several months after the March 31, 2009 start of the new ISO market.

Similarly, as explained further below and in the Declarations of Ms. Morris and Mr. Berberich, the ISO also made decisions beginning in January 2009 to maintain all software development resources for the purpose of ensuring that the ISO's new market design could be implemented by March 31, 2009 without any further delay. For the ISO to have met the fifteen-month convergence bidding development schedule it believed was feasible at that time to ensure delivery of convergence bidding by March 31, 2010, the ISO would have had to divert resources from the go-live effort to convergence bidding development. As the months went by, the go-live effort required software development resources to remain devoted to ensuring the March 31, 2009 implementation date would be met. Once the new market design was launched, these same resources remained vital for several months to ensure that the launch would be successful. Although the ISO strongly believes these decisions were critical to the successful launch of the March 31, 2009 market, they also made it impossible to implement convergence bidding by March 31, 2010.

C. Following Resumption of the Stakeholder Process, All Critical Policy Determinations Have Been Made

At the ISO's 2009-2011 Release Planning Workshop held on June 24, 2009, the ISO provided stakeholders with a proposed schedule for developing and implementing convergence bidding based on the resumption of the

stakeholder process and software development.[24] The ISO's schedule for convergence bidding has continued to be refined in the past few months, based in part on the input of stakeholders.

The ISO resumed the stakeholder process on the policy elements of convergence bidding design in July of this year, with the publication of its Straw Proposal on July 2. This presentation was discussed at a convergence bidding stakeholder meeting on July 9, 2009.[25] Additional stakeholder meetings on the convergence bidding design were held on August 13, August 27, September 9, September 18, and October 9, 2009. In addition, on September 18, the ISO Market Surveillance Committee held a joint meeting with stakeholders to discuss the convergence bidding design. On September 14, in anticipation of the September 18 stakeholder meeting, the ISO posted on its website its draft final proposal for the convergence bidding design. On October 2, the ISO posted an addendum to the draft final proposal for discussion at the October 9 stakeholder meeting. Stakeholders were given opportunities to provide verbal and written comments on the draft final proposal and the addendum.

In sum, as a result of concerted efforts by the ISO and stakeholders to address all of the remaining policy issues as promptly as possible in recent months, those issues were all resolved within a period of approximately four months (July-October 2009). The design of the ISO's convergence bidding

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[24] See ISO presentation entitled "2009-2011 Release Planning Workshop" (June 24, 2009), at slides 6 and 57 ("June 24 Presentation"). This presentation is available on the ISO's website at: http://www.caiso.com/23d2/23d28b4029240.pdf.

[25] This presentation is available on the ISO's website at: http://www.caiso.com/23e4/23e4f0033cb50.pdf.

market feature was presented to and approved by the Board at its meeting on October 29, 2009.[26] The ISO is filing for Commission approval of its convergence bidding design policy simultaneously with the filing of this motion. Therefore, all of the critical policy decisions on convergence bidding have been made and are now presented for Commission approval.

The ISO's schedule for developing and implementing convergence bidding has two tracks. One track relates to the documentation of the convergence bidding design policy in tariff language and detailed business practices. The other track is related to the design, development, testing, and simulation of the software modifications which will implement convergence bidding. The following is the ISO's current schedule for the non-software component:

- December 2009 - February 2010 – Stakeholder process on tariff language to implement convergence bidding
- December 2009 – Publish external business requirements (Scheduling Infrastructure Business Rules already published but will be updated)
- First Quarter 2010 – Submit tariff language to implement convergence bidding for Commission approval, with the specific filing date being determined based on the date the Commission issues an order on the ISO's filing of the convergence bidding design policy and whether the order requires significant modifications to the convergence bidding design policy
- Second Quarter 2010 – Publish convergence bidding technical specifications
- Third Quarter 2010 – Develop material for inclusion in the ISO's Business Practice Manuals ("BPMs")

[26] The materials presented to the Board for its review at the October 29 meeting are available on the ISO's website at: http://www.caiso.com/244e/244e8eae13040.html.

This schedule is discussed further in the attached Declaration of Ms. Miller. The following is the ISO's current schedule for developing and implementing the software package needed to implement the convergence bidding market feature:

- December 2009 - May 2010 – Build convergence bidding software (*i.e.*, develop, construct, and achieve factory acceptance of the software)
- June 2010 - September 2010 – Test convergence bidding software and integrate it with the ISO's existing software
- October 2010 - January 2011 – Conduct market simulation of convergence bidding
- February 1, 2011 – Implement convergence bidding

This schedule is discussed further in the Declaration of Janet Morris, provided as Attachment B to this filing. As the schedules indicate, the critical path or driver of the ISO's ability to implement convergence bidding by February 1, 2011 is the software development, testing, and simulation process rather than the non-software components, which will be completed by Third Quarter 2010.

D. Development and Testing of the Software for Convergence Bidding Creates Significant Technical Challenges

As discussed in the Declaration of Khaled Abdul-Rahman, Principal, Power Systems Technology Architecture & Development for the ISO, provided as Attachment C to this filing, the convergence bidding market feature will require extensive modifications to most of the ISO's new software systems. The software applications that will require modifications in order to implement convergence bidding are the day-ahead applications, the real-time applications, the Full Network Model, the Scheduling Infrastructure Business Rules, the

Settlements and Market Clearing software, the ISO Master File, the CAISO Market Results Interface, the ISO's Open Access Same-Time Information System, and the software the ISO uses to calculate credit limits. The broad cross-functional impacts of the convergence bidding market feature make it one of the most complex market enhancements under development by the ISO for the foreseeable future. The only ISO market enhancement of comparable complexity is multi-stage generation unit modeling, which is currently under development as discussed below.

The convergence bidding software poses unique technical challenges. At the ISO's request, the ISO's primary software vendor, Siemens Energy, Inc. ("Siemens"), prepared a technical paper on some of the challenges associated with developing, testing, and implementing convergence bidding software. This technical paper, "California ISO – Convergence Bidding Technical Challenges" ("Siemens Technical Paper"), is posted on the ISO's website[27] and is provided as Appendix 2 to the Declaration of Mr. Abdul-Rahman. Among the technical challenges identified by Siemens are:

- The impacts of virtual bids (*i.e.*, convergence bids) on network power flows;
- Burdens associated with implementing position limits;
- The need to coordinate delivery schedules of various complex market features having impacts on the Market Power Mitigation, Integrated Forward Market, and Residual Unit Commitment applications;
- The difficulty of estimating the "right" duration of the market simulation period and ensuring coordinated involvement of market participants in simulations;

[27] *See* http://www.caiso.com/240a/240a7ace60860.pdf.

- The impacts on memory space and storage of potentially large numbers of bids and virtual resources;

- The impacts of day-ahead virtual bidding on the real-time nodal operations;

- The impacts of large numbers of virtual bids (and large numbers of high MW quantity bids) on quality of solution and the ability of the ISO's software to perform market solutions; and

- The challenges in determining which practices of other markets with different virtual bidding features should be considered "best practices" to be incorporated into the ISO's convergence bidding software.

As explained by Mr. Abdul-Rahman, these technical challenges make it difficult to accelerate the schedule for convergence bidding software development and testing. In order to help address the technical challenges, the ISO formed a working group comprised of stakeholders to discuss technical issues related to the implementation of convergence bidding. The technical working group has been meeting bi-weekly since early September.[28] Although the ISO believes this working group has made significant progress on several issues and has fostered a better understanding of the challenges discussed in the Siemens Technical Paper, to date this group has not been able to develop a feasible plan to enable the ISO to significantly accelerate the schedule for developing and testing the convergence bidding software. Even if the schedule cannot be accelerated, however, resolution of the technical challenges would help ensure that the ISO's eighteen-month schedule can be met.

[28] Materials regarding the technical working group on convergence bidding are available on the ISO's website at: http://www.caiso.com/241e/241e6f6335bc0.html. The meetings of the technical working group are included on the ISO's monthly meetings and training calendars available at: http://www.caiso.com/meetings/index.cgi.

Due to the technical challenges associated with the convergence bidding software, there are a limited number of software experts, both at the ISO and at its primary software vendor, Siemens, which have the expertise to work on the development of a complex market feature like convergence bidding. As explained by Ms. Morris, Siemens has approximately thirty employees dedicated to the development, testing, and enhancement of the ISO's market software. In his Declaration, provided as Attachment A, Mr. Berberich, the Vice President of Corporate Services for the ISO, explains that the ISO has authorized Siemens to hire or assign additional employees to work on the convergence bidding project. The addition of these contractors, however, will have only a modest impact on the convergence bidding development schedule. The ISO asked Siemens directly whether the commitment of additional employees or further financial resources could significantly hasten the convergence bidding development, testing, and implementation schedule, and Siemens responded that these additional measures would have no significant impact on its timetable for developing the convergence bidding software.

Moreover, as discussed below and in the Declaration of Ms. Morris, by the end of 2008, it became apparent to the ISO that Siemens would need to focus fully on getting the day-one MRTU software ready for implementation. At that time, the ISO consulted with a different software vendor to explore the possibility of having a separate vendor develop the convergence bidding software. The other software vendor told the ISO that it did not have the expertise to do the work on an expeditious basis given the unique features of the ISO's new

software platform. Based on its experience with the other software vendor, the ISO has concluded that its primary market software vendor remains the best choice for the most timely development and implementation of convergence bidding.

E. Resource Commitments Needed to Ensure the Safe and Reliable Start-up and Launch of the New ISO Market Resulted in Modifications to the Schedule for Convergence Bidding

During the time period from the end of 2008 to March 31, 2009, the ISO's software experts and Siemens were focused on ensuring the successful implementation of the new ISO market.[29] At the time of the October 2008 stakeholder meeting on convergence bidding, it was expected that the new ISO market would go into effect as soon as three months later because, following discussion at the September 2008 meeting of the ISO Governing Board, the ISO had targeted January 31, 2009, as the go-live date for the new ISO market.[30] The planned go-live date was then adjusted first to a targeted date of March 1, 2009,[31] and then, after discussion at the Board's December 2008 meeting, to a targeted go-live date of March 31, 2009,[32] the date that the new ISO market was in fact implemented. At the December 2008 Board meeting, ISO management

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[29] *See, e.g.*, *California Independent System Operator Corp.*, 126 FERC ¶ 61,262, at P 95 (2009) ("The CAISO notes that . . . in the near term, its resources must necessarily be focused on ensuring a successful MRTU launch."); *California Municipal Utilities Ass'n v. California Independent System Operator Corp.*, 126 FERC ¶ 61,315, at P 58 (2009) ("The CAISO states that it would be an unnecessary distraction to undertake a new revision at this time, especially in light of the extensive resources that the CAISO and its stakeholders are investing in preparation for go-live.").

[30] Transmittal letter for MRTU status report filed in Docket No. ER06-615-000 on October 6, 2008, at 2.

[31] Transmittal letter for MRTU status report filed in Docket No. ER06-615-000 on December 8, 2008, at 1-2.

[32] MRTU Readiness Certification, Docket No. ER06-615-038 (Jan. 15, 2009), at 5-6.

also committed to make every effort to implement the new ISO market on March 31.[33] This full commitment of resources to day-one market implementation is discussed in the Declaration of Mr. Berberich.

In late 2008 and early 2009, the best information available to the ISO suggested that convergence bidding would take approximately fifteen months to develop and implement, with Siemens' continued development and testing of the necessary software being the "critical path" in that effort.[34] Therefore, based on a go-live date of March 31, 2009, the ISO would have needed Siemens to resume developing the convergence bidding software in early January of 2009 in order to permit convergence bidding to go into effect approximately fifteen months later (*i.e.*, one year after implementation of the new ISO market). The ISO planned to request that Siemens resume that software work after the ISO was able to establish a "freeze" of its MRTU software codes. However, due to the need for additional software development resources to ensure the successful launch of the new ISO market by March 31, the ISO was unable to freeze the software codes until January 31.[35]

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[33] December 2008 Board motion regarding decision on MRTU program (available on the ISO's website at: http://www.caiso.com/209f/209f1395126c0.pdf). This motion also stated that stakeholder shared ISO management's commitment to implementing the new ISO market on March 31.

[34] See the ISO presentation entitled "MAP (Markets and Performance) Update" (Oct. 16, 2008), at slides 2-4. This presentation, which was made at the ISO's October 2008 convergence bidding stakeholder meeting, is available on the ISO's website at: http://www.caiso.com/2060/2060e6dd1aaa0.pdf.

[35] See ISO document entitled "MRTU Cutover and Reversion High-Level Timeline – Milestones" (Mar. 6, 2009). This document is available on the ISO's website at: http://www.caiso.com/2346/2346edec46f10.pdf.

From the end of January until March 31, and for the first few months of operations, the ISO decided that it was essential for its own resources and Siemens' resources to remain focused on the new market. The focus of the ISO on implementing the new ISO market is indicated by a review of the items listed in the ISO's monthly meeting and training calendars for January through March of 2009.[36] Most of these items concern the efforts to implement the new ISO market. It was not possible to resume longer-term initiatives such as convergence bidding.

From March 31 until mid-May of 2009, the ISO's software experts and Siemens had to focus their attention on a new task – ensuring that the new ISO market would function correctly in an active production environment. This meant that the ISO and Siemens did not have the ability to resume work on convergence bidding software development during the initial period of the new ISO market.

By mid-May of 2009, the ISO and Siemens were in a position to focus attention on post-day-one market enhancements, including convergence bidding. The ISO and Siemens held a meeting on resuming development of the convergence bidding software, followed by re-validation and vendor contract negotiation.

As explained by Ms. Morris, the overall impact of this commitment of resources to the day-one market was a delay in the convergence bidding software development schedule of approximately six months. Moreover, even if

[36] These monthly ISO calendars are available on the ISO's website at: http://www.caiso.com/meetings/index.cgi.

the ISO and Siemens had been able to resume work on the convergence bidding software in January 2009 (*i.e.*, fifteen months prior to the one-year anniversary of market start-up), much of that work would have involved a needless expenditure of time and effort, because the design and specifications of the convergence bidding software would have needed to be modified later based on the final policy decisions made in the stakeholder process that concluded in October 2009.

F. Lessons Learned During the Testing and Market Simulation of New Market Software Systems Led to Additional Modifications to the Schedule for Convergence Bidding

Beginning in May 2009, the ISO has updated the schedule required to develop and implement the convergence bidding design. The schedule reflects lessons learned from the ISO's experience with the development and testing of the new ISO market. The schedule also takes into account other significant post-day-one market enhancements under development. As evidenced by the need to adjust the targeted go-live date for MRTU on several occasions, the ISO's initial estimates of the time needed to test complex new software applications and conduct simulations of the new market were somewhat optimistic.

As explained by Mr. Berberich and Ms. Morris, the ISO undertook an effort to apply the lessons learned from the market launch to the development of new market features. One of the primary lessons was that the schedule had to build in additional time for the development, testing, and market simulation of the critical-path component of the convergence bidding project – the software. In order to ensure an ample safety margin for the development and testing of the convergence bidding software, the ISO determined that the schedule needed to

be approximately eighteen months from the resumption of software development efforts, not the fifteen months the ISO had previously believed would be required. The eighteen-month schedule comprises four months for the design of the convergence bidding software, which is expected to be completed at the end of this month, six months for building the convergence bidding software, four months for software testing and integration, and four months for market simulation.

This schedule includes a safety margin of approximately 20 percent to account for complications that have not yet been identified. The ISO's experience with market launch strongly suggests that such a contingency margin is often needed for complex software applications like convergence bidding. As Ms. Morris explains in her Declaration, based on her 25 years of experience in the software design field, the ISO's eighteen-month timetable is consistent with industry practice for this type of very advanced software design. The convergence bidding software design is a customized application of a complex set of elements that requires iterative development and testing before it can be deployed. The consequences of a less rigorous development and testing schedule than the ISO proposes would be an increased risk of flaws in the software design that could lead to greater delays in the overall implementation schedule.

The current convergence bidding schedule also reflects the strong desire of a wide range of market participants that certain significant software changes not be implemented during certain periods. These "hands off" periods include

the summer months and the months of December and January. As Ms. Morris explains, due to limited employee availability at the end of each calendar year, market participants are not in a position to best address complications or uncertainty that can occur during the roll-out of a significant market enhancement.

In addition, market participants have indicated that neither December 1 nor January 1 is available for the implementation of substantial changes to their systems due to the need to adhere to the requirements of the Sarbanes-Oxley Act,[37] which sets forth mandates and requirements for financial reporting by public companies. Therefore, even if the ISO were somehow able to trim a couple of months from the current eighteen-month schedule, the ISO would still not be able to implement convergence bidding because of the hands off period occurring in late 2010 and early 2011. The proposed implementation date of February 1, 2011 for convergence bidding reflects these concerns.

G. The Proposed Convergence Bidding Development Schedule Reflects the Appropriate Order for the Development and Implementation of Market Features Required to Comply with Commission Orders

Concurrently with the development of convergence bidding, the ISO is also developing other market enhancements to comply with Commission orders, including multi-stage generation unit modeling (also called multi-stage generation modeling or "MSG"). The implementation of MSG will allow combined cycle resources to be modeled accurately and would supplant the need to implement

[37] Sarbanes-Oxley Act of 2002, Pub. L. 107-204, 116 Stat. 745 (codified at 15 U.S.C. §§ 7201-7266).

the "forbidden operating region" functionality originally designed and intended for day one implementation, but had to be "deferred" because of implementation problems in the real-time market. The forbidding operating region functionality is one of the four "deferred functionality" features of the new ISO market that the Commission, in its January 30, 2009 order in Docket No. ER09-213-000,[38] authorized the ISO to defer implementing until after start-up. Multi-stage generation modeling is currently scheduled to be implemented in April 2010, but as discussed below, the ISO is considering implementing MSG in a two-stage process.[39]

In the deferred functionality proceeding, the Commission accepted a timetable for the development of multi-stage generation modeling that called for it to be completed prior to the twelve-month time period for the implementation of convergence bidding: "The Commission will accept the CAISO's commitment to develop the multi-stage modeling functionality within six to nine months following MRTU go-live. We strongly encourage the CAISO to work to meet that target, thereby minimizing the number of instances in which the CAISO will need to manually intrude on the market *via* Exceptional Dispatch."[40] Similarly, in the Exceptional Dispatch proceeding (Docket Nos. ER08-1178 and EL08-88), the Commission acknowledged the importance of implementing multi-stage generation modeling in order to reduce the number of Exceptional Dispatches:

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[38] *California Independent System Operator Corp.*, 126 FERC ¶ 61,081 (2009).

[39] Materials regarding MSG and the MSG stakeholder process are available on the ISO's website at: http://www.caiso.com/2078/2078908392d0.html.

[40] *California Independent System Operator Corp.*, 126 FERC ¶ 61,081, at P 30.

> [W]e expect reliance on Exceptional Dispatch to decrease as the CAISO gains operations and modeling experience. For example, the CAISO states that it is committed to exploring improvements to MRTU functionality and enhancements to the full network model that will reduce the need for Exceptional Dispatch. Specifically, the CAISO notes that it has initiated a stakeholder process to develop the capability to model multi-stage generating units, and that it is exploring options to incorporate the modeling of constraints such as the Pacific DC Intertie. The CAISO anticipates that these improvements will dramatically reduce the number of exceptional dispatches.[41]

There is significant overlap between multi-stage generation modeling and convergence bidding in that both of those initiatives have broad cross-functional impacts and have applications to the real-time and day-ahead markets. Therefore, as explained by Mr. Abdul-Rahman, Siemens personnel and ISO software experts have determined that, from a software development perspective, it is necessary to develop and build the multi-stage generation functionality before convergence bidding. This determination is based on the broad cross-functional impacts of convergence bidding that call for a redesign of the Scheduling Infrastructure Business Rules to process convergence bids, development and integration of new software modules to perform aggregation and disaggregation of convergence bids at the same locations, and necessary system infrastructure and platform changes required to mitigate the impact that convergence bidding has on performance and the market timeline. In addition, convergence bidding requires extensive testing efforts to evaluate the impact of convergence bidding on cleared physical bids and overall market prices and locational marginal prices ("LMPs").

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[41] *California Independent System Operator Corp.*, 126 FERC ¶ 61,150, at P 33 (2009) (citation omitted).

Implementation of multi-stage generation before convergence bidding enables the ISO to utilize the current market systems to test and deploy the multi-stage generation functionality before the major system and applications changes are made in order to accommodate convergence bidding. Implementing multi-stage generation before convergence bidding may also mitigate the risk of misuse of convergence bidding to arbitrage the differences between the day-ahead application that enforces forbidden regions, and the real-time application that does not support that feature. Fixing the forbidden operating region feature in the real-time application is one of the major benefits of implementing multi-stage generation. In addition, the individuals at Siemens and the ISO who possess the expertise to work on the development of the multi-stage generation modeling software are largely the same personnel who are needed to work on the convergence bidding software.

This conclusion is consistent with stakeholder input provided in the release planning stakeholder process. The majority of stakeholders would not support a potential delay in the implementation of multi-stage generation modeling even if such a delay allowed for earlier implementation of convergence bidding.

The ISO is considering implementing MSG in two phases. Siemens has recently advised the ISO that it may be able to complete development of the forbidden operating region functionality prior to other elements of multi-stage generation modeling. The ISO presented this concept of a phased implementation of multi-stage generation modeling to stakeholders at a release

planning workshop on November 10, 2009. The ISO hopes to present a specific recommendation for the development and implementation of multi-stage generation modeling to the ISO Board of Governors at its meeting in mid-December of 2009. Even if the ISO proposes phased implementation of multi-stage generation modeling, the ISO expects that all phases of multi-stage generation modeling should be implemented prior to implementation of convergence bidding for the multi-stage generation modeling software code, which will serve as a platform on which convergence bidding functionality will be based.

The ISO has also determined that delaying other market enhancements under development is unlikely to have an impact on the convergence bidding schedule. For example, in the September 2006 Order, the Commission accepted a limited scarcity pricing proposal submitted by the ISO for the initial release of the new ISO market and directed the ISO to develop and implement a more extensive scarcity pricing approach within twelve months of market start-up.[42] The ISO is conducting a stakeholder process on scarcity pricing in order to satisfy the Commission's directives.[43] Delaying the implementation of scarcity pricing would not allow convergence bidding to go into effect any sooner, because scarcity pricing is primarily a pricing and settlements enhancement that (unlike convergence bidding) does not involve a completely new product or integration with other ISO systems. Therefore, the scarcity pricing initiative can

[42] September 2006 Order at PP 1078-79.

[43] Materials regarding this stakeholder process are available on the ISO's website at: http://www.caiso.com/1bef/1bef12b9b420b0.html.

continue in parallel with the convergence bidding initiative without affecting the schedules for either of them.

The ISO's prioritization, which is supported by Siemens and supported by many stakeholders, reflects a logical order for a controlled implementation, deployment, and testing of significant market enhancements will be: multi-stage generation modeling and scarcity pricing, then convergence bidding.[44]

H. The ISO Has Explored Additional Measures to Expedite the Implementation of Convergence Bidding

The ISO has considered further measures to expedite the implementation of convergence bidding and has taken the measures that further that purpose. The ISO hired additional consulting staff who served as project managers and system analysts during the design phase of convergence bidding. As explained by Mr. Berberich, the ISO asked Siemens to add additional resources to this project. As discussed above, the ISO previously had explored bringing in a separate vendor to focus on convergence bidding development and, after the project was declined by a reputable vendor with which the ISO had discussions, the ISO concluded that a separate vendor would be unlikely to complete the project within the desired timeframe.

Some stakeholders have suggested that the ISO should simply adapt the software used by other independent system operators ("ISOs") and regional transmission organizations ("RTOs") with convergence bidding features for use in the new ISO market. As explained by Mr. Abdul-Rahman in his Declaration, although the ISO has a market design based on locational marginal prices that is

[44] Siemens Technical Paper at 1.

similar to the markets of other ISOs and RTOs, the software platform underlying the new ISO market is completely different from the software platforms used by other ISOs and RTOs. As a result it is not possible to simply "plug and play" software designed for other ISO and RTO markets into the ISO's systems.

In short, the ISO has considered a full range of measures to expedite the implementation of convergence bidding given the current status quo. Although modest improvements to the overall schedule are possible, none of the scenarios that the ISO believes are attainable would permit convergence bidding to be ready for implementation by March 31, 2010 – the deadline currently applicable under the September 2006 Order. Therefore, the ISO has concluded that the need for an extension of time to implement convergence bidding is unavoidable.

III. Attachments

The following documents support this filing:

Attachment A	Declaration of Steve Berberich, the Vice President of Corporate Services for the ISO
Attachment B	Declaration of Janet Morris, Director of the Program Office for the ISO
Attachment C	Declaration of Khaled Abdul-Rahman, Principal, Power Systems Technology Architecture & Development for the ISO
Attachment D	Declaration of Margaret Miller, Senior Market Design and Policy Specialist for the ISO

IV. Conclusion

For the foregoing reasons, the ISO respectfully requests that the Commission grant this motion for an extension of time, until February 1, 2011, to comply with the directives in the September 2006 Order to implement convergence bidding in the ISO's new market.

Respectfully submitted,

/s/ Sean Atkins

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Dated: November 20, 2009

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon 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 Washington, D.C. this 20th day of November, 2009.

/s/ Bradley R. Miliauskas
Bradley R. Miliauskas

ATTACHMENT A

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	))	**Docket No. ER06-615-___**

DECLARATION OF STEVE BERBERICH ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

I. Introduction

Q. Please state your name and business address.

A. My name is Steve Berberich. My business address is 151 Blue Ravine Road, Folsom, California 95630.

Q. By whom and in what capacity are you employed?

A. Since November 2005, I have been employed as the Vice President of Technology & Corporate Services and Chief Financial Officer of the California Independent System Operator Corporation ("ISO"). I was the executive sponsor responsible for implementing the ISO's new market design also known as the market redesign and technology upgrade ("MRTU") project.

Q. What is the purpose of your declaration in this proceeding?

A. I will address two subjects in my declaration. First, I will discuss the ISO's commitment to the implementation of convergence bidding. Second, I will discuss how the ISO, during certain critical months including the first several months after market launch, needed to give priority to the timely and successful

implementation of the new ISO market, which contributed to the extension of the convergence bidding schedule.

II. The ISO's Commitment to the Implementation of Convergence Bidding

Q. Is the ISO committed to implementing convergence bidding as soon as practicable?

A. Yes, completely committed. The ISO recognizes that convergence bidding has proven to be a valuable market design feature in other wholesale electricity markets, and the ISO believes convergence bidding will bring comparable benefits to the ISO's markets. Moreover, the ISO recognizes that the Commission has directed the ISO to develop and implement convergence bidding. These directives reflect the high priority that the Commission and many market participants have placed on expeditious implementation of convergence bidding. The ISO takes its regulatory obligations very seriously. The ISO made the decision to seek additional time to implement convergence bidding only after concluding that an extended schedule is unavoidable.

Q. Please briefly explain why the ISO does not believe it will be able to implement convergence bidding within twelve months of the start of the new ISO market, as directed in the Commission's September 21, 2006 order in this proceeding.

A. The need for additional time to implement convergence bidding is due to the realities of developing and testing complex software changes, the impacts of

resource commitments made by the ISO to ensure the safe and reliable start-up of the new ISO market earlier this year, and lessons learned during the testing and market simulation of the new ISO market software systems.

Q. Has the ISO considered or taken any steps to expedite the implementation of convergence bidding?

A. Yes. As discussed in the Declaration of Janet Morris, Director of the Program Office for the ISO, the ISO has considered several steps to expedite the implementation of convergence bidding.

Q. What steps has the ISO taken?

A. I and other officers of the ISO wanted to ensure that the need to extend the convergence bidding project schedule was not driven by a lack of sufficient resources. To that end, my staff met with Siemens Energy, Inc. ("Siemens") in May of this year to explore Siemens' commitment to developing convergence bidding. I then personally met with Siemens on September 14, 2009, to gain the commitment of vendor resources and explore whether by hiring additional staff, Siemens would be able to develop and implement convergence bidding more quickly. While I confirmed Siemens' commitment to develop the convergence bidding software, and Siemens agreed to add additional resources, I learned that adding new Siemens resources to the convergence bidding project would not materially advance the schedule due to the extensive learning curve required. At a minimum, a new resource would have to become familiar with all of the

software associated with the new market design, including additional enhancements currently under development, before beginning to work on convergence bidding. Accordingly, adding additional resources would not materially hasten the software development timeline.

Q. Has the ISO Governing Board provided any guidance on the schedule for implementation of convergence bidding?

A. Yes. At its September 2009 meeting, the ISO Board directed ISO management to explore options to expedite development and implementation of convergence bidding. The discussion with the Board made it clear, however, that the schedule must allow for the safe and reliable testing and implementation of convergence bidding as a major new market feature. The current schedule for convergence bidding with implementation planned by February 2011 is consistent with the Board directives to develop a schedule that allows for the safe and reliable testing and implementation of a major new market feature. The ISO is planning to have its final scope and schedule for convergence bidding complete by the December 2009 Board meeting.

III. To Ensure No Further Delay, the ISO Needed to Give Priority to the Timely and Successful Implementation of the New ISO Market on March 31, 2009

Q. Did any ISO activities occur from the end of 2008 to March 31, 2009 that impacted the development of a convergence bidding proposal?

A. Yes. During late 2008, all of the resources of the ISO and Siemens were devoted exclusively to ensuring that the new market could be implemented in the first half of

2009. In October 2008, it was expected that the new ISO market would go into effect as soon as three months later because, following discussion at the September 2008 meeting of the ISO Governing Board, the ISO had targeted January 31, 2009, as the go-live date for the new ISO market. The planned go-live date was then adjusted first to a targeted date of March 1, 2009, and then, after discussion at the Board's December 2008 meeting, to a targeted go-live date of March 31, 2009, which turned out to be the date that the new ISO market was implemented. At the December 2008 Board meeting, ISO management also committed to make every effort to implement the new ISO market on March 31. Based on the fifteen-month convergence bidding software design timeline that had been developed at that time, the ISO would have had to divert ISO and Siemens resources to convergence bidding beginning in January, 2009. At that time, diversion of any resources from the go-live effort would have resulted in an additional delay of the implementation of the new market design. As time passed, it became clear that it would not be possible to divert resources from the go-live effort and meet the March 31, 2009, implementation date. Although I made no overt decision to delay convergence bidding, the incremental decisions made to stay on course to meet the March 31, 2009, implementation date contributed to the delay of convergence bidding.

Q. **When the ISO made the decision to focus its software development resources solely on the timely and successful implementation of the new ISO market, were ISO officers aware that this decision would impact the schedule for implementation of convergence bidding?**

A. I and other officers were aware that the need to commit 100% of our resources to launch of the day-one market could have an impact on the schedule for convergence bidding. Nonetheless, we felt the priority had to be the new market since no further functionality could be started or implemented until the new market went live and a sufficient stabilization period had occurred. As I stated above, there was no opportunity to divert resources to other important projects without jeopardizing the March 31, 2009 implementation of the ISO's new market. In addition, the extent of the modifications to the schedule for development and implementation of convergence bidding was not clear until the ISO re-assessed the convergence bidding schedule starting in May 2009. As discussed in the declarations of my colleagues, many factors contributed to the modified schedule including lessons learned from the launch of the new market; the ISO does not want to develop timelines based on unrealistic timelines that would require multiple extension of time.

Q. Do you believe the full commitment of software development resources to the day-one market was necessary for the successful launch of the new ISO market?

A. Yes. Absent this full commitment of internal and Siemens' resources, I believe launch of the new ISO market could not have occurred on March 31, 2009. The go-live date for the new market could have been delayed substantially and almost certainly would have occurred after the summer months of 2009. In addition, any delay in the launch of the new market would have led to a delay in the implementation of a convergence bidding market feature.

Q. Did any ISO activities occur from March 31, 2009 to May 2009 that impacted the development of a convergence bidding proposal?

A. Yes. From March 31 until mid-May of 2009, the ISO's software experts and Siemens had to focus their attention on a new task – ensuring that the new ISO market functions correctly in an active production environment. This meant that the ISO and Siemens did not have the ability to resume work on convergence bidding software development during the initial period of the new markets.

Q. Did the ISO's experience leading up to the new ISO market influence in any other ways the schedule for developing convergence bidding?

A. Yes. As Ms. Morris explains in her Declaration, the ISO sought to apply the lessons learned from the market launch to the development of new market features, with one of the most important lessons being that an ample safety margin must be built into the schedule for the development, testing, and market simulation of the convergence bidding software. In order to ensure an ample safety margin, the ISO determined that the duration of the schedule had to be approximately eighteen months from the resumption of software development efforts, not the fifteen months the ISO had previously believed would be required.

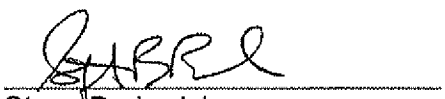
Q. What is the main message you would like the Commission and interested parties to take from this filing?

A. The ISO understands that there was considerable concern about the proposed extension of the convergence bidding schedule due to expectation that the ISO would be able to implement convergence bidding on the one year anniversary of the new market. Our goal here is to lay out in considerable detail the full reasons why the extension to the convergence bidding schedule, while unfortunate, was unavoidable and to provide the Commission and parties with a realistic timeline for implementing convergence bidding.

Q. Does this conclude your declaration?

A. Yes, it does.

I affirm under penalty of perjury that the foregoing statements are true and correct to the best of my knowledge, information, and belief.



Steve Berberich

Executed this 20th day of November, 2009.

ATTACHMENT B

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	))	**Docket No. ER06-615-___**

DECLARATION OF JANET MORRIS ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

I. Introduction

Q. Please state your name and business address.

A. My name is Janet Morris. My business address is 151 Blue Ravine Road, Folsom, California 95630.

Q. By whom and in what capacity are you employed?

A. I am employed as the Director of the Program Office of the California Independent System Operator Corporation ("ISO"). As Director of the Program Office, I am responsible for overseeing the schedule for development, testing, and implementation of significant market enhancements, including convergence bidding.

Q. Please describe your professional and educational background.

A. I joined the ISO in 2003 as Contract Project Manager, became Senior Project Manager in 2006, became Manager of the Program Office in 2007, and in 2009, I assumed my current job. In these positions, I have worked extensively in the

project management and implementation of new market initiatives, such as the new ISO market now in effect.

I received my Bachelor of Science degree in Computer Science from California Polytechnic State University in San Luis Obispo, California, and my Master of Science degree in Engineering Management from Santa Clara University in Santa Clara, California. After graduating, I spent over 18 years as a Project Manager in Software Research & Development and Service for Hewlett-Packard. For the four years before I joined the ISO, I was the Director of Engineering responsible for Project Management for Commerce One, an internet software company. I have a total of over 25 years of experience in the software design field. My *curriculum vitae* is provided in Appendix 1 to my declaration.

Q. What is the purpose of your declaration in this proceeding?

A. I will discuss a number of factors which contributed to the need to extend the schedule for the development and implementation of convergence bidding, particularly as to the software required to implement convergence bidding.

II. Overview of the Project Life Cycle of the ISO's Convergence Bidding Initiative

Q. What is a "project life cycle," as that term is used by the ISO?

A. A project life cycle is a methodology employed by the developers of major software projects, including the ISO in the development of market enhancements, for the following purposes: to provide a baseline set of

program/project management and system development processes; reference related processes and procedures for software development and integrating them into the ISO's corporate standard processes, policies, and procedures; specify typical deliverables; and offer criteria for monitoring and measuring the products and activities of the program/project. A project life cycle consists of a number of components called project phases.

Q. What are the components of an ISO project life cycle?

A. Those components are the following: (1) a conceptualization phase; (2) an initiation phase; (3) a planning phase; (4) an execution phase, which for information technology ("IT") projects such as convergence bidding is comprised of sub-phases concerning design, construction, testing, and implementation; and (5) a close-out phase. These components are detailed in Version 1.3 of the "Program Lifecycle Methodology" document available on the ISO's website.[1]

Q. Does the project life cycle for the ISO's convergence bidding project include all of these components?

A. Yes, it does.

Q. Can the events in the project life cycle for the ISO's convergence bidding initiative be categorized based on a timeline?

A. Yes. The events regarding the development of the convergence bidding initiative can be categorized as falling into three successive time periods: (1)

[1] http://www.caiso.com/237c/237cab828060.pdf.

convergence bidding development activities that took place from June 2006 to the end of 2008; (2) the temporary suspension of convergence bidding development activities from the end of 2008 to May 2009; and (3) the resumption of convergence bidding development activities in May 2009 and the continuation of those activities until convergence bidding is implemented no later than February 1, 2011.

Q. What ISO contractor is primarily responsible for developing and testing the software needed to implement convergence bidding?

A. Siemens Energy, Inc. ("Siemens") is the vendor that will, in consultation with the ISO, develop and test the software needed to implement convergence bidding.

Q. Can the convergence bidding development activities be divided into any component activities?

A. Yes. There are two separate but related components of the convergence bidding development activities – the software component, which is being developed by the ISO and Siemens, and the policy component, which has been developed by the ISO through the stakeholder process. My declaration will focus on the software component. Margaret Miller addresses the policy component in her declaration.

Q. Please describe the software development activities that the ISO and Siemens undertook from June 2006 to the end of 2008.

A. Through the end of 2008, the ISO and Siemens worked on developing the initial design specifications for the convergence bidding software and took all other actions they could to push the software design effort forward. However, much of the software design effort could not be completed until after the major decisions regarding the policy component of convergence bidding had been finalized. As Ms. Miller explains in her declaration, the policy component was finalized only after market start-up in March 2009.

Q. **Please describe events from the end of 2008 to May 2009 that affected the schedule for developing and implementing the convergence bidding software.**

A. As explained in greater detail in the Declaration of Steve Berberich, during the time period from the end of 2008 to May 2009, the ISO determined that its software development resources needed to be maintained for the purpose of ensuring the timely and successful implementation of the new ISO market. This meant that convergence bidding software development activities had to be temporarily suspended during that time period.

Q. **At that time, how long did the ISO estimate it would take from resumption of convergence bidding efforts to implementation of convergence bidding?**

A. In late 2008 and early 2009, the best information available to the ISO suggested that convergence bidding would take approximately fifteen months to develop and implement, with Siemens' continued development and testing of the

necessary software being the "critical path" in that effort. Therefore, based on a go-live date of March 31, 2009, the ISO would have needed Siemens to resume developing the convergence bidding software in early January of 2009 in order to permit convergence bidding to go into effect approximately fifteen months later (*i.e.*, one year after implementation of the new ISO market). The ISO planned to request that Siemens resume that software work after the ISO was able to establish a "freeze" of its MRTU software codes. However, due to the need for additional software development resources to ensure the successful launch of the new ISO market by March 31, the ISO was unable to freeze the software codes until January 31.

Q. From January 2009 until May 2009, was Siemens able to perform any convergence bidding development activities?

A. No. From the end of January until March 31, it was impracticable for the ISO or Siemens to divert their time and personnel from the efforts to timely complete the software needed to safely and reliably run the new ISO market. In February and March, software development resources were fully committed to the launch of the day-one market. From March 31 until mid-May of 2009, the ISO's software experts and Siemens had to focus their attention on a new task – ensuring that the new ISO market functions correctly in an active production environment. This meant that the ISO and Siemens did not have the ability to resume work on convergence bidding software development during the initial period of the new markets.

Q. What impact did this commitment of resources to the day-one market have on the convergence bidding software development schedule?

A. The overall impact of this commitment of resources to the day-one market was a delay in the convergence bidding software development schedule of approximately six months.

Q. Do you believe there would have been issues which could have affected the convergence bidding schedule even if development of the convergence bidding software resumed in January 2009?

A. Yes. Even if the ISO and Siemens had been able to resume work on the convergence bidding software in January 2009 (*i.e.*, fifteen months prior to the one-year anniversary of market start-up), much of that work likely would have involved a needless expenditure of time and effort, because the design and specifications of the convergence bidding software would have needed to be modified later based on the final policy decisions made in the stakeholder process that concluded in October 2009.

Q. Please describe the convergence bidding development activities that took place during the period from May 2009 to date.

A. By mid-May of 2009, the ISO and Siemens were in a position to turn their attention back to convergence bidding. The ISO and Siemens held a meeting regarding the re-starting of the convergence bidding software development,

followed by approximately two months of re-validation and vendor contract negotiation.

At the ISO's Release Planning Implementation stakeholder meeting held on August 19, 2009, Siemens made a presentation on technical challenges associated with implementing convergence bidding. The technical challenges are discussed in the Declaration of Khaled Abdul-Rahman.

Q. Has the ISO solicited input from stakeholders on options to accelerate the development and implementation of convergence bidding?

A. Yes. During the Release Planning Implementation stakeholder meeting held on August 19, the ISO asked stakeholders to volunteer to join a convergence bidding implementation working group to discuss the technical challenges associated with convergence bidding. This working group, which includes representatives from interested stakeholders, Siemens, and the ISO itself, has been meeting on a biweekly basis since September 3, 2009. The objective of the working group was to work collaboratively to resolve technical challenges during the software design phase of convergence bidding. Based on the resolution of technical challenges, the remainder of the implementation schedule could be re-assessed and potentially accelerated. Even if the schedule could not be accelerated, resolution of technical challenges would help ensure that an eighteen month schedule would be met.

Q. Please describe the ISO's current convergence bidding development and implementation schedule.

A. The ISO's current schedule for developing and implementing convergence bidding has two tracks. One track concerns the documentation of the convergence bidding design policy in tariff provisions and business practices. The other track relates to the design, development, testing, and simulation of the software modifications to implement convergence bidding. Ms. Miller describes the first track in her declaration and I address the second track.

Q. What are the key upcoming dates and events regarding the second, software-related track?

A. The ISO's schedule for the software modification track includes the following events and associated dates:

- December 2009 - May 2010 – Building of convergence bidding software (*i.e.*, development, construction, and achievement of factory acceptance of the software)
- June 2010 - September 2010 – Testing of the convergence bidding software and integration of it with the ISO's existing software
- October 2010 - January 2011 – Performance of market simulation of convergence bidding
- February 1, 2011 – Implementation of convergence bidding

The ISO acknowledges that the current schedule is premised on the Commission's acceptance of its extension request.

III. The Development and Testing of the Software Needed to Implement Convergence Bidding

Q. Is there a limiting factor in the development and implementation of convergence bidding?

A. Yes. The limiting factor or critical path in the development and implementation of convergence bidding is the development of the required software.

Q. How complicated a process will it be to develop and test the convergence bidding software?

A. As Mr. Abdul-Rahman explains in his Declaration, most of the ISO new market software applications will need to be modified in order to implement convergence bidding. Due to these broad cross-functional impacts of convergence bidding, development of convergence bidding is considerably more complicated than the other market enhancements currently under development by the ISO. There is a relatively small group of experts with sufficient expertise in the relevant ISO software systems that will need to be involved in developing and testing the convergence bidding software changes. Siemens has approximately 30 employees dedicated to the development, testing, and enhancement of the ISO's market software. These employees are working on other ISO market software issues and enhancements in addition to the ISO's convergence bidding software.

Q. Was this relatively small group of experts involved in the development of the development of the convergence bidding software in the months leading up to, and the months after, implementation of the new ISO market?

A. For part of that time period, yes. These experts were engaged in defining the planning and requirements for convergence bidding through the end of 2008, which included determining how to build into the software code sufficient flexibility to accommodate the final policy decisions on convergence bidding design. For example, the initial design specifications developed through the end of 2008 required the convergence bidding software to be configurable to accommodate either a nodal or zonal convergence bidding design. For the period from the end of 2008 through May 2009, however, the ISO's market software experts, including the subgroup of experts on the software systems most directly related to convergence bidding, were fully dedicated to ensuring the safe and reliable implementation of the "day-one" market.

Q. Why didn't the ISO direct the convergence bidding software experts to work on convergence bidding at all from the end of 2008 through May 2009?

A. Absent full dedication of resources to the day-one market, the ISO does not believe the successful launch of the new ISO market could have occurred on March 31 of this year or within a similar time frame. One unavoidable by-product of this commitment of resources to the day-one market was a delay in the convergence bidding software development schedule.

Q. Instead of using Siemens to develop the convergence bidding software, couldn't the ISO instead use another software vendor to do that work?

A. No. In late 2008, it became apparent to the ISO that Siemens would need to focus fully on getting the day-one MRTU software ready for implementation. Therefore, at that time the ISO consulted with a different software vendor to explore the possibility of having a separate vendor develop the convergence bidding software. The other software vendor told the ISO that it did not have the expertise to do the work on an expeditious basis given the unique features of the ISO's new software platform. The functionality of new market features will build on elements embedded in the current software design, and thus it would be difficult for a new vendor without expertise in the existing software to "bolt on" a new feature. Based on its experience with the other software vendor, the ISO concluded that Siemens, the ISO's primary market software vendor, remains the best choice for the most timely development and implementation of convergence bidding.

Q. Besides the need to work on developing the new ISO market, has anything else caused a delay in the convergence bidding software development schedule?

A. Yes. Experience with the launch of the new ISO market demonstrated that the ISO's initial estimates of the time needed to adequately test complex new market software products and conduct simulations with market participants were somewhat too optimistic. Based on this experience, the ISO has adjusted the schedule for all future launches of complex market products to allow sufficient time for testing and market simulation. Application of these "lessons learned" from the market launch

has resulted in a further extension of the convergence bidding implementation schedule.

Q. How much of an extension of the convergence bidding implementation schedule has resulted from an application of the "lessons learned" from the market launch?

A. The ISO undertook an effort to apply the lessons learned from the market launch to the development of new market features. One of the primary lessons was that the schedule needed to build in additional time for the development, testing, and market simulation of the critical-path component of the convergence bidding project – the software. In order to ensure an ample safety margin for the development and testing of the convergence bidding software, the ISO determined that the schedule needed to be approximately eighteen months from the resumption of software development efforts, not the fifteen months the ISO had previously believed would be required.

This schedule includes a contingency margin of approximately 20 percent to account for complications that have not yet been identified. The ISO's experience with market launch strongly suggests that such a contingency margin is often needed for complex software applications like convergence bidding.

Q. Based on your own experience, is the ISO's eighteen-month schedule for the convergence bidding software design appropriate?

A. Yes. As I stated, I have worked for over 25 years in the software design field, and based on that experience the ISO's eighteen-month timetable is consistent with industry practice for this type of very advanced software design. I also view the ISO's timetable as appropriate based on the lessons learned in the development of the new ISO market, my experience with multiple change orders of similar size, and my familiarity with the software vendor.

Q. What is it about the development and testing of the convergence bidding software that requires an eighteen-month schedule?

A. The convergence bidding software design is a customized application of a complex set of elements that requires extensive development and testing before it can be deployed. Eighteen months are required in order to complete four necessary phases of development and testing, which are as follows:

- Design phase (four months)
- Construction phase (six months)
- Systems testing (four months)
- Market simulation and deployment (four months)

Each of these phases involves a considerable expenditure of time and effort in order to translate business requirements into software design features, translate the software design features into software code, and test the software with all applicable interfaces. While the four phases are listed sequentially, the work on them is actually iterative in nature as progress is made in elaborating on the logic of the software and testing the software under operating conditions.

The development and testing process needs to be especially rigorous due to the extensive impact of convergence bidding on the ISO's systems. The implementation of convergence bidding will impact nine major ISO business processes and ten ISO software applications. It will also require the creation of an entirely new application – a credit system. All of these changes must be integrated with each other, and the required software testing will have to be considerable based on the number of new requirements and the need for regression testing.

Q. Are there other reasons for the need to extend the schedule for implementing convergence bidding?

A. Yes. The current convergence bidding schedule also reflects the strong desire of a wide range of market participants that certain significant software changes not be implemented during certain periods. These "hands off" periods include the summer months and the months of December and January. Due to limited employee availability at the end of each calendar year, market participants are not in a position to best address complications or uncertainty that can occur during the roll-out of a significant market enhancement. Also, market participants have indicated to the ISO that neither December 1 nor January 1 is available for the implementation of substantial changes to their systems due to the need to follow the requirements of the Sarbanes-Oxley Act, which market participants have explained sets forth mandates and requirements for financial reporting by public companies. The

proposed implementation date of February 1, 2011 for convergence bidding reflects these concerns.

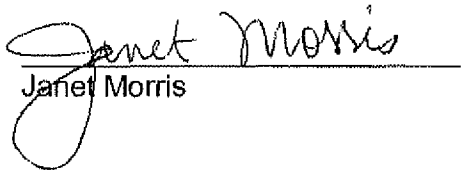
Q. Has the ISO considered or taken any steps to expedite the implementation of convergence bidding?

A. Yes. The ISO has authorized Siemens to hire or assign additional employees to work on the convergence bidding project. The addition of these contractors, however, will have only a modest impact on the convergence bidding development schedule because it will take time for the consulting staff to learn the software applications and requirements for convergence bidding. The ISO asked Siemens directly whether the commitment of additional employees or further financial resources could significantly hasten the convergence bidding development, testing, and implementation schedule, and Siemens responded that these additional measures would have no significant impact on its timetable for developing the convergence bidding software.

Q. Does this conclude your declaration?

A. Yes, it does.

I affirm under penalty of perjury that the foregoing statements are true and correct to the best of my knowledge, information, and belief.



Janet Morris

Executed this 20th day of November, 2009.

Appendix 1

JANET E. MORRIS

PROFILE

Innovative leader with a unique talent for managing aggressive growth and change in highly technical sectors with a proven track record in:

- ✓ Demonstrating strong ingenuity and ability to execute to strategic plans
- ✓ Consistently delivering complex initiatives and support programs within scope, schedule and budget
- ✓ Leading by example with a contagious "can-do" approach
- ✓ Presenting new ideas and facilitating solutions at all levels
- ✓ Bringing vendors and cross functional teams to a collaborative place in periods of extremely high accountability

Relevant areas of focus:

+ Business Continuity Planning
+ CMMI Certification
+ Demand Response Programs
+ Electrical Energy Markets
+ Integrated Forward Markets
+ Procurement
+ Program Management
+ Readiness
+ Risk Management
+ Software Development Lifecycle
+ Software Engineering
+ Sourcing
+ Service Oriented Architecture
+ Supply Chain Management
+ Vendor Management

EDUCATION

- Santa Clara University, Santa Clara, CA: **M.S., Engineering Management**
- California Polytechnic State University, San Luis Obispo, CA: **B.S., Computer Science,** Scholastic Honors
- U.C. Davis Extension: **Renewable Energy Series** (studies in biomass, solar, and environment friendly resources)
- CAISO Academy in conjunction with The Juran Institute: Quality and Process Improvement classes based on teachings of W. Edwards Deming applied to today's business challenges. Process improvement project: Transmission Planning Process
- Currently seeking PMI Certification – experience far exceeds requirements.

PROFESSIONAL EXPERIENCE

California ISO, Folsom, CA (2003-Present)

California ISO is the Independent System Operator for the electrical power grid in California, see: http://www.caiso.com

Director, Program Office

- Under direction of the Vice President of Corporate Service, provide strategic program management responsibility for multi-disciplinary and cross-functional capital programs in support of five year business plan and market initiatives roadmap.
- Manage programs ranging from small (less than $1M) to large (greater than $10M) and span from months to years. Current portfolio includes efforts to reduce cash clearing for all markets, management of aggregated credit liability, introduction of virtual bidding, renewable resource integration to meet regulatory standards, and demand response programs to meet operational needs.
- Direct a team of senior project managers, business analysts, and business process owners with enterprise responsibility for CMMI certification, risk management, and cost/benefit analysis.
- Collaborate with external stakeholders on the market initiatives release plan and brief the executive team and Board of Governors on a monthly basis.
- As part of the Market Redesign and Technology Update (MRTU) program, provided project management of Integrated Forward Market and Real Time Market application development, providing business requirements oversight, vendor management of prime software vendor, factory and site acceptance testing. Managed project budget of over $30M over three year period. These applications are utilizing mixed integer programming (MIP) to solve complex unit commitment optimization problems using bid in supply to meet forecasted demand.

Consultant / Project Manager

- Provided software quality and testing consultation to program-level test management team, including oversight of six project team test plans, program test plans, and review of all quality gates based on pre-determined criteria. Integration testing is based on service oriented architecture (SOA) with over 140 unique XML web services.
- Implemented best practices to ensure meeting MRTU quality objectives in the areas of test environment management, testing tools, and testing methodology, which will be permanently adopted within the enterprise.
- Comprehensive project management responsibility for the successful rollout of the new electrical energy market design. Enterprise level coordination of cut over plans, back out procedures, and internal and external stakeholder readiness assessments leading to a smooth transition of all systems going live on time, while maintaining the highest definition of reliability.

Commerce One, Pleasanton, CA (1999-2003)

Commerce One was the software company leading the vision in electronic supply chain management and XML based marketplace messaging. See: http://www.CommerceOne.com

Director of Engineering – Program Management

Responsibilities included program management of development engineers, product managers, support professionals, QA organizations, and technical publications to ensure that product schedules, scope and quality requirements were met. Conducted weekly program review with Senior VPs and led release readiness presentations with executive staff. Organized and resolved technical issues with engineering staff. Led customer focused forums, including market research efforts and user acceptance testing.

- *Directed integration of first joint software release between Commerce One and SAP*, within three month deadline, by providing onsite leadership at SAP facility of approximately 25 joint resources, in time for highly publicized product announcement and demo. Built multiple-server lab environment to conduct testing of nine customer-defined use cases. Interacted with SAP consultants to resolve technical issues beyond the expertise of the assigned staff. Joint product delivered to five global market place exchanges on release date as expected with all manufacturing procedures intact.
- *Commerce One Conductor Platform*: Orchestrated release of Conductor Platform to deliver product on time and within scope during period of infrastructure volatility. This project required coordination of over 200 engineers spanning three locations. Organized technical reviews of over 30 functional areas and managed hundreds of integration points through master project plan, including daily review of critical path and completed tasks on due date. Controlled hundreds of third party interfaces and license agreements through extensive bill of materials process. Led change management of internal and external interfaces. Managed delivery to 11 Early Adopter customers to establish proof points for platform as an infrastructure for the creation, deployment, integration and management of XML based web services.
- *Commerce One Source Suite:* Pioneered initial product release of Source application suite, followed by numerous major and minor releases, under strict quality requirements from leading customers. Provided program management of Commerce One Auction™ which spanned a 12 month initiation to release lifecycle, with 90 FTEs assigned to development. Maintained strong customer involvement with Covisint, an automotive global exchange, including weekly review of project plan. Initial development to Covisint resulted in over 1200 successful auction events in the first four weeks, delivering multi-million dollar savings in their supply chain sourcing.
- *Commerce One MarketSite:* As first program manager to be hired at Commerce One, established and executed manufacturing release process during period of intense time to market capitalization. Solution deployed at 100+ global enterprises and thrust Commerce One into forefront of the business-to-business e-commerce market. Managed engineering schedule, initiated change management process and patent application process to protect company assets.
- As company grew from 200 to 3500 employees, hired and managed a team of seven senior program managers responsible for specific product areas, spanning both applications and platform core teams. Played a key role in strategic product planning and prioritization.
- Drove engineering partnership activities with Sun Microsystems, including initial port of twelve commercial products to Sun Solaris platform and performance optimization and tuning efforts. Negotiated for Sun resources to be applied to product budget based on time to market considerations.

Hewlett-Packard, Mountain View, CA (1996-1999)

Hewlett-Packard is the pioneer of Silicon Valley computing and provides a vast array of computer products and services. See http://www.hp.com

Software Services Project Manager – Software Services Division

- Managed team of knowledge engineering specialists responsible for providing technical information and training to worldwide support organization. Visited worldwide customer call centers to research knowledge needs of technical support engineers.
- Led multi vendor content acquisition program for integration of partner information with knowledge repository. Defined process to review over 10,000 technical documents and make them accessible to OEM partners in the Asia-Pacific region.
- Analyzed direct line engineer call closure patterns and proposed solutions that were delivered through online search topics. Created search topic content for HP-UX software, Microsoft products, and other partner products.

Personal/Family Leave of Absence (1993-1996)

Hewlett-Packard, Cupertino, CA (1982-1993)

Hewlett-Packard is the pioneer of Silicon Valley computing and provides a vast array of computer products and services. See http://www.hp.com

R&D Project Manager – Commercial Systems Division

- Built and managed a team of up to twelve engineers responsible for providing strategic software solutions which enabled third party software vendors and major customer accounts to be successful on the HP3000 computer platform.
- Managed team of up to eleven engineers responsible for rapid resolution of critical MPE operating system defects. Successfully supported all customer sites during initial release of new versions.
- Created and taught seminars on testing strategies to third party software vendors and internal software development engineers.
- Initiated and led training program to reduce engineering rework and increase productivity.
- Maintained close relationship with top ten customer accounts culminating in annual, on-site meeting to review long-term strategy and short-term priorities.
- Investigated, designed, developed, tested, and released business software for the HP3000.

INTERPERSONAL SKILLS

- ✓ Hands-on management style with track record for getting highest performance from team members
- ✓ Solid technical skills and desire to work with technical and non-technical staff to meet project goals
- ✓ Known for being extremely productive in managing multiple, demanding tasks
- ✓ Acknowledged for ability to remain clear-minded and maintain calmness in high stress situations
- ✓ Effective in diverse environments of technical and non-technical professionals and para-professionals

References and consent to background check available upon request

ATTACHMENT C

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	))	**Docket No. ER06-615-___**

DECLARATION OF KHALED ABDUL-RAHMAN ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

I. Introduction

Q. Please state your name and business address.

A. My name is Khaled Abdul-Rahman. My business address is 151 Blue Ravine Road, Folsom, California 95630.

Q. By whom and in what capacity are you employed?

A. I am employed as Principal, Power Systems Technology Architecture & Development for the California Independent System Operator Corporation ("ISO").

Q. Please describe your professional and educational background.

A. I have worked in the electric power system industry for over a decade, focusing primarily on management and software design. Between March 2006 and July 2009 I was employed as the Independent Principal Consultant for Electricity Markets at Siemens Transmission & Distribution, where my responsibilities included supporting Energy Market Management software areas and putting the Security Constrained Unit Commitment and Constrained Dispatch software used

in the new ISO market into action. Since July, I have worked for the ISO as the Principal for Power Systems Technology Architecture and Development. My current responsibilities include tasks related to the implementation of convergence bidding and scarcity pricing, and the development of a strategy to handle industry changes anticipated over the next five to ten years. My *curriculum vitae* is provided in Appendix 1 to my declaration.

Q. What is the purpose of your declaration in this proceeding?

A. I will discuss the complexity and challenges associated with developing software to implement convergence bidding. I will also explain how software development considerations are the primary driver for the need to extend the convergence bidding schedule.

II. The Need for, and Development and Testing of, the Software Required to Implement Convergence Bidding

Q. Please summarize the scope of software changes which will be needed to implement convergence bidding.

A. In order to implement convergence bidding, most of the MRTU software applications will need to be modified. Specifically, modifications will need to be made to the Day-Ahead applications, Real-Time applications, the Full Network Model, the Scheduling Infrastructure Business Rules ("SIBR"), the Settlements and Market Clearing ("SaMC") software, the ISO Master File, the CAISO Market Results Interface ("CMRI"), the ISO's Open Access Same-Time Information System ("OASIS"), and the software the ISO uses to calculate credit limits.

Q. Could the ISO simply adapt for its own use the convergence or virtual bidding software of another Independent System Operator or Regional Transmission Organization?

A. No. Although the ISO has a market design based on locational marginal pricing ("LMP") similar to the markets of other Independent System Operators ("ISOs") and Regional Transmission Organizations ("RTOs"), the software platform underlying the new ISO market is completely different from the software platforms used by other ISOs and RTOs. The new California ISO market software is based on Siemens Spectrum Power energy market management systems that are integrated with more than 20 other California ISO systems that perform various business and operational functions on Web-based services and a Service-Oriented Architecture. As a result it is not possible to simply "plug and play" software designed for other ISO and RTO markets into the California ISO's systems.

Q. Which vendor has been chosen to develop and test the new software needed for that ISO purpose?

A. Siemens Energy, Inc. ("Siemens") is the entity that will, in consultation with the ISO, develop and test the software needed to implement convergence bidding.

Q. Are there any foundational software enhancements that must be implemented in advance of convergence bidding?

A. Yes. There are two foundational software enhancements that must be implemented in advance of convergence bidding. The first is simplified ramping, which was implemented on November 12, 2009. The second is the multi-stage generation functionality. Both Siemens personnel and ISO software experts, including myself, have determined that, from a software development perspective, it is necessary to develop and build the multi-stage generation functionality before convergence bidding. This determination is based on the broad cross-functional impacts of convergence bidding that call for redesign of the Scheduling Infrastructure Business Rules to process convergence bids, development and integration of new software modules to perform aggregation and disaggregation of convergence bids at the same locations, and necessary system infrastructure and platform changes required to mitigate the impact that convergence bidding has on performance and the market timeline. In addition, convergence bidding requires extensive testing efforts to evaluate the impact of convergence bidding on cleared physical bids and overall market prices and LMPs. Implementation of multi-stage generation before convergence bidding enables the ISO to utilize the current market systems to test and deploy the multi-stage generation functionality before the major system and applications changes are made in order to accommodate convergence bidding. Implementing multi-stage generation before convergence bidding may also mitigate the risk of misuse of convergence bidding to arbitrage the differences between the day-ahead application that enforces forbidden regions, and the real-time application that does not support that feature. Fixing the "forbidden region" feature in the

real-time application is one of the major benefits of implementing multi-stage generation. In addition, the individuals at Siemens and the ISO who possess the expertise to work on the development of the multi-stage generation modeling software are largely the same personnel who are needed to work on the convergence bidding software.

Q. Although the convergence bidding software has not been developed, have the requirements for that software already been written?

A. Yes.

Q. Please describe the requirements that have been written for convergence bidding software.

A. The software requirements for convergence bidding have been written to be configurable. This means that the software requirements have sufficient flexibility to accommodate a range of possible alternative policy decisions regarding convergence bidding, and in particular the decision of whether to implement convergence bidding on a nodal basis, zonal basis, or both.

Q. Has Siemens explained the technical challenges that must be overcome in developing the convergence bidding software?

A. Yes. Siemens has provided to the ISO a paper on the subject entitled "California ISO – Convergence Bidding Technical Challenges," which is posted on the ISO's website and is provided in Appendix 2 to my declaration.

Q. Please summarize the technical challenges that Siemens explains in its paper.

A. Among the technical challenges identified by Siemens are:

- The impacts of virtual bids on network power flows;
- Burdens associated with implementing position limits;
- The need to coordinate delivery schedules of various complex market features having impacts on the Market Power Mitigation, Integrated Forward Market and Residual Unit Commitment applications;
- The difficulty of estimating the "right" duration of the market simulation period and ensuring coordinated involvement of market participants in simulations;
- The impacts on memory space and storage of potentially large numbers of bids and virtual resources;
- The impacts of day-ahead virtual bidding on the Real-Time Nodal operations;
- The impacts of large numbers of virtual bids (and large numbers of high MW quantity bids) on quality of solution and the ability of the ISO's software to perform market solutions within the current market timeline; and
- The challenges in determining which practices of other markets with different virtual bidding features should be considered "best practices" to be incorporated into the ISO's convergence bidding software.

Q. What effect do these technical challenges have on the schedule for convergence bidding software development and testing?

A. These technical challenges make it difficult to accelerate the schedule for convergence bidding software development and testing. If convergence bidding did not affect so many other ISO market systems, it would be more feasible to accelerate the timeline for developing and testing the software. Another technical

challenge to accelerating the delivery timeline is the need to perform study tests on the impact that convergence bidding will have on cleared physical bids at different node and load aggregation point ("LAP") levels and on LMP pricing in general even before the start of convergence bidding market simulation. Because of these challenges, however, the ISO has concluded that it would not be prudent to target an earlier implementation date without a clearly defined plan for attaining that implementation date.

Q. Has the ISO concluded that an implementation date for convergence bidding earlier than February 2011 is impossible?

A. No. The ISO has not made its final determination. But based on vendor discussions, and taking into account the additional input of the working group, the ISO has not been able to identify steps that would allow for the ISO to target an earlier implementation date with any confidence.

Q. Does this conclude your declaration?

A. Yes.

I affirm under penalty of perjury that the foregoing statements are true and correct to the best of my knowledge, information, and belief.

K. H. Abdul-Rahman

Khaled Abdul-Rahman

Executed this 20th day of November, 2009 in Folsom, California.

Appendix 1

Dr. KHALED H. ABDUL-RAHMAN
Principal, California ISO
Power Systems Technology Architecture & Development
Tel: 916.802.0026 | Fax: 916.351.2487 | E-mail: *kabdul@caiso.com*
151 Blue Ravine Rd., Folsom, CA 95630

Summary
Dr. Khaled Abdul-Rahman offers high caliber consulting services developed over 15 years experience in a variety of applications related to Electricity Markets Design, software implementation, Testing, and on-line deployment. Dr. Abdul-Rahman's deep knowledge of the electrical power industry restructuring coupled with his advanced technical and analytical skills, information technology experience, and his management and personal skills make him a perfect fit to assume key roles in projects related to various aspects of the electric power system industry.

Dr. Abdul-Rahman has been closely involved with various different types of entities in this industry including academic institutions, vertical electric utilities, independent system operators, power systems software vendors, Database vendor, and consulting firms. Specifically, Dr. Abdul-Rahman career involves working on projects at:

- California Independent System Operator (CAISO): Non-profit Transmission Grid Operator and Electricity Markets Facilitator
- Siemens Energy: Major EMS and Electricity Market Systems vendor for ISOs and electric Utilities in the area of energy management and automation.
- Energy Consulting Company, International: A recognized International Consulting firm in the area of Power Systems and Electricity Markets design, operations, and market performance evaluations.
- Alliance Regional Transmission Operator (ARTO): For-Profit Transmission Grid Operator
- Illinois Power Company: Electric Utility
- Florida Power and Light: Electric Utility
- Siemens, ABB, and ESCA: Recognized major vendors for Energy Management Systems, and integrated Electricity Markets software in the US and abroad.
- Open Access Technology International: Major vendor for Tagging & Scheduling, OASIS, Portfolio management software
- Oracle Corporation: Major vendor for Database and Information Managment software
- Sargent & Lundy Engineers: A recognized International Consulting Firm in the area of nuclear and coal power plant stations design.
- Illinois Institute of Technology (IIT): A recognized International Academic and Research Institution.

PROFESSIONAL EXPERIENCE

Leadership Experience and Major Achievements:

California Independent System Operator (CAISO) (July 2009 – Present)- **Principal, Power Systems Technology Architecture & Development**

Responsibility includes working closely with various Internal CAISO groups including Project Management Office, Market Infrastructure & Development, Market Operations, Grid Operations, and Legal and Tariff groups, as well as external entities such as Market Participants and software vendors. Current Responsibilities include:

- Develop business requirements, detailed software design, software implementation, testing, and deployment plans for the following projects:
    - **Virtual Convergence Bidding in Day-Ahead Market**: bid volume limits, AC power flow issues, market power mitigation, reliability must-run issues, software testing, and market simulations plans.
    - **Scarcity Pricing**: Ancillary Services Marginal Price under AS scarcity situations.
- **Strategy Framework Project**: Core Team member to develop a detailed strategy plan and roadmap for CAISO for the next 5 to 10 years to cope with industry changes related to increased integration of renewable resources, advances in smart grid technologies, and other environmental and policy drivers.
- **CAISO Training Academy**: Instructor for power system analysis and market optimization training classes for CAISO employees.

Siemens Transmission & Distribution – Energy Management & Automation Division, (March 2006 – July 2009), **Independent Principal Consultant – Electricity Markets**

Responsibilities include: Provide Functional Definition and Business Requirement support in the Energy Market Management software areas; Accomplish design and implementation tasks within the Security Constrained Unit Commitment and Constrained Dispatch software; Provide application support and functional expertise on Siemens' customer sites; Assist Siemens's customers with application testing activities; Provide Analysis of complex analytical scenarios based on implemented market design rules; Provide Business knowledge and recommendation for the integration of market system with other customer's legacy systems; Provide on-site support for cutover, and Go-Live activities.

Energy Consulting Company International (ECCO), (Mar 2001 – Feb 2006), **Independent Electricity Markets & Power Systems Managing Principal Consultant**

California ISO (July 2002 – Jan 2006)- *Subcontractor for ECCO:*

Assisting California ISO in its effort in re-designing all market applications including Full Network Modeling of the CAISO system, Integrated Forward Market, and Real-Time Nodal LMP market. This Market Re-design Technology Upgrade (MRTU) project involves switching from zonal pricing to a full network model, and Locational-Marginal Pricing (LMP) on the nodal level. This effort involves:

- CAISO Test Team Lead for managing the daily Testing of ***Siemens*** Forward and Real-Time Markets software including the following functions: Market Power Mitigation (MPM), Integrated Day-ahead forward Market, Reliability Unit Commitment (RUC), Integrated

Hour-Ahead Process, Real-time Pre-Dispatch, Interval Dispatch, Contingency Dispatch, Manual Dispatch, and Very-Short-Term-Load-Prediction (VSTLP). The software involves state-of-the-art modeling for complicated features such as dynamic ramp rates as a function of resources' MW, prohibited regions, network constraints with AC power flow, nomograms, co-optimization of energy and A/S services, as well as the use of the Common Information Model (CIM) and additional extensions for network and market data representations. The Siemens' software is based on the ILOG-CPLEX optimization library to solve the mixed integer programs of the different markets.

- Assist in the requirements definition, software design, and managed the daily software testing of the Integrated Forward Market and the Real-Time markets including the co-optimization of energy and ancillary services, Market Power Mitigation (MPM), and Reliability Unit Commitment (RUC) applications.
- Member of the Congestion Revenue Rights (CRR) implementation Team.
- Assist in resolving modeling issues related to the use of full AC network model inside California ISO control area.
- Assist in identifying criteria, and resolving issues related to CAISO State Estimator (SE) which is used as a feed to the RTN market.
- Assist in writing functional requirements for the forward markets Request For Proposal (RFP).
- Assist in the screening, evaluation, and selection process of the market software vendor.
- Member of the forward markets Content Team to assess the technical capabilities/shortcomings of the different candidate vendors.
- Assist in the unit commitment data collection and results analysis of the CAISO Forward Market Proof-of-Concept (POC) project using ***Siemens***'s Security Constrained Unit commitment (SCUC) software package.
- Member of the CAISO Real-Time market application validation and Testing Team to perform Factory Acceptance Test for the ***ABB***'s Real-Time software package. This effort involved testing SCED optimization engine, testing SCUC optimization engine, testing out-of-market sequence (OOS).
- Member of a CAISO team for utilizing ***ABB***'s transmission constrained unit commitment software to assist Grid Operators issue the waiver denial instructions for must-offer resources.

Cap Gemini Ernst & Young (CGEY) (Mar 2001 – Dec 2001),)- *Subcontractor for ECCO*
Member of the Cap Gemini Ernst & Young Project Management Office for the Alliance Regional Transmission Organization (RTO) in the area of Market Operation Applications to coordinate between the different software vendors.

- Lead software Tester for the **Alliance RTO** Imbalance Energy Market software including testing and verifying the market user interface for portfolio definitions and bids submission, interfaces to load forecast, tagging &scheduling, loss calculator, real time data, security coordinator, NERC IDC, optimal market dispatch of bids, and imbalance charge calculations under both pay-as-bid and pay-as-MCP pricing mechanism.
- Training of the Alliance RTO Imbalance Energy Market Coordinator personal to review and confirm imbalance bids from generation suppliers, watch for abnormalities in quantity or

pricing curves, analyze changing internal load trends taking into consideration season, time of day and weather changes.
- Technical lead for the Alliance RTO data conversion activities including Service Points, Paths, Flowgates, and OASIS Users information.
- Technical lead for the conversion of the metadata describing Alliance RTO real-time data points from the Inter-regional Security Network (ISN) format to *Siemens* Inter-Control-Center-Protocol (ICCP) XML format
- Developed Technical Training material about the Alliance RTO in the areas of OASIS, Tagging & Scheduling, Imbalance Engine, Security Coordinator, and general overview if the electric energy deregulation and the different industry models.
- Member of the Alliance RTO Technical Team. Participated in the definition requirement, design and business processes of the real time Imbalance Energy Market based on Locational Marginal Pricing (LMP) with provisions to settle as pay-as-bid or pay-as-market-clearing-price.

ECCO International, (Mar 2001 – Present), **Independent Electricity Markets & Power Systems Managing Principal Consultant**
- Provide consulting services in areas related to the de-regulated electricity market including generating reports summarizing the strengths and drawbacks of PJM electricity market and a comparison of *PJM, New York ISO, ISO New England* and *ERCOT* electricity markets. (*Direct Time & Material Contract*)
- Assist in writing an *EPRI* Research Report on "Integrated Engineering and Economic Operation of Power Systems" (*Direct Time & Material Contract*)

Illinois Power Company (subsidiary of Dynegy), (Jan 2002 – July 2002), **Independent Power Systems Principal Consultant**
- Technical Project Lead for developing Illinois Power (IP)'s real time Network Model to run network topology, state estimator, power flow and contingency ranking & analysis using PTI's PSS/O API calls to an Oracle Database Implementation of the power system Common Information Model (CIM). The developed tool assists IP's control center operators study their power system behavior, evaluate switching conditions, check any system configuration for operating problems, and help operate the system in an economical and secure manner. (*Direct Time & Material Contract*)

Open Access Technology International (OATI), Inc., (Feb 2002 – June 2002), **Independent Power Systems Principal Consultant**
Project Manager and software Lead Developer for OATI's Automated Decision Support tool for Bidding (ADSB) software. The project involves database integration, User interface development and algorithm enhancements to the ADSB software. The ADSB software identifies optimal bidding strategies for energy, spinning and non-spinning reserves markets. ADSB uses market information together with information on the generating units, fuel costs, O&M, bilateral agreements, and other positions to help generate optimal bidding strategies for energy, spinning, and non-spinning reserves markets. (*Direct Fixed Cost Contract*)

Oracle Corporation, Oracle Consulting for Electric Utilities, (Nov 1998 – Feb 2001), **Managing Principal Consultant**

- Technical Lead for a discovery phase team to put together a technical architecture plan and proposal for the migration of AT&T Global Operation accounting legacy system to Oracle Technology.
- Technical lead for proposing Oracle On-line Marketing package to *SBC* (Ameritech).
- Functional Team Lead for the utility billing requirements for *ORCOM* (Denver, CO - Scottsbluff, NE - Bend, OR). This is part of a discovery phase for the implementation of a complete Oracle solution for Customer Information System (CIS), Customer Relationship Management (CRM), ERP and Data Warehouse portal. ORCOM is an Application Service Provider (ASP) for CIS and CRM applications to customers ranging from energy service providers (ESP) to utility distribution companies (UDC).
- Provided functional expertise to *BC Hydro Grid Operation Group*, Vancouver, Canada, in the area of Transmission and Energy Scheduling under a joint effort with *ALSTOM ESCA*. This effort included definition of functional requirement and process flows for curtailment, buy-at-market, alternate POR/POD, firm, non-firm and secondary transmission reservations and ATC calculations and updates to OASIS among other things.
- Provided preliminary technical architecture design and functional requirements for the ISO/PXs CIO Council in North America. The Council consists of all Independent System Operators and Power Exchanges in North America.
- Technical Lead for the assessment of the *California ISO* internal Data Warehouse development Project, Sacramento, CA, including gathering information about the processes and data flows between the various market functions and operational systems.
- Project Lead for the *Nevada Power Services* (NPS) Project, Las Vegas, NV, for the integration of NPS 3rd party systems (Lodestar, Banner, Proform and Energy Trading applications) and design of data storage and user interface requirements
- Project Manager and Functional Lead for the Electric Power Research Institute (EPRI) Project, Palo Alto, CA to integrate its Topology Processor application to Oracle-based Common Information Model (CIM) database via Control Center Application Program Interface (CCAPI)
- Representing the US power industry in an Oracle Global Energy Team to identify future software requirements and products needed for Energy Trading. This effort involved studying the needs of different energy markets in US, and Europe. Meetings were conducted in the US, Canada, England, France, and Sweden with various vendors in this area.
- Representing Oracle in the Control Center Application Interface (CCAPI) Committee of the Electric Power Research Institute (*EPRI*) Common Data Access Task Force in 1999.

Siemens Power Systems Control, (Nov 1994 – Mar 1998), **Software Applications Lead Engineer**

- Technical Team lead for the development of Resource Scheduling and Bid Evaluation software for *Siemens*; a major Energy Management Systems (EMS) vendor in the power systems industry.
- Technical lead for the design phase of the PJM Unit Commitment program and its interface with the Generation Database (GDB).

- Responsible for Identifying new models and solution algorithms for linear and nonlinear optimization problems with various constraints such as fuel, emission, transmission network and comprehensive transactions models.
- Technical lead for the Oracle-based Florida Power and Light (FPL) Unit Commitment project. This effort involved data migration from the Cyber system to Oracle DB on Unix, and migration of displays and interfaces from FPL legacy systems.
- Technical Lead in the area of Unit Commitment for Al-Salvador and Israel Energy Management Systems.

Energy Management Systems (EMS) Software Development Experience:

Siemens Power Systems Control, (Nov 1994 – Mar 1998)

- Developed a prototype for a Price Based Unit Commitment with generation and demands bids.
- Developed and integrated a Security Constrained Unit Commitment base product for Siemens Power Systems Control. The software is based on the augmented Lagrange relaxation optimization technique and considers physical unit constraints as well as system operating constraints such as demand, reserve and network transmission constraints. The software used Oracle as its relational database and ORACLE Forms as the user input/output interface. This software product is operational at many national and international Energy Management Control Centers.
- Implemented the first distributed computing approach for unit commitment using parallel virtual machines (PVM) software.
- Developed a very specialized approach and solution technique for Short/Mid-Term Unit Commitment incorporating fuel allocation, transmission line flow limits, and area generation protection constraints for a major power utility.
- Coded and tested Interface software between SCADA and EMS functions for Siemens Power Systems Control.
- Developed active and reactive power optimization packages for power systems operation.

Power Systems Analytical Studies:

Sargent & Lundy Engineers, Sr. Electrical Analytical Engineer, (April 1998 – Oct 1998)

- Performed transmission system interconnection and impact studies due to planned capacity addition and/or re-powering of generation plants
- Performed Transient analysis and Short circuit fault current calculations for a nuclear power station in Wisconsin, USA.
- Developed and tested a Mathcad calculation shell program for the Ampacity of wrapped cable trays for a nuclear power station in mid-Illinois, USA.

Illinois Institute of Technology (IIT), Lecturer and Sr. Researcher, (Jan. 1994 – Oct.1994)

- Developed an artificial intelligence approach utilizing fuzzy set theory, neural networks and expert system to solve the reactive power optimization problem.

- Co-Principal investigator for studying the effects of regional power transfers and open transmission access on real-time power system control (the first US Department of Energy sponsored project in this area).

Marketing and Sales Technical Support Experience:

- I have the sole responsibility for marketing and selling my consulting services as an independent Consultant to various electric utilities, RTOs/ISOs, power systems software vendors, and other energy consulting companies (2001-Present).
- Technical Lead for a Discovery Phase Team to put together a technical architecture plan and proposal for the migration of AT&T Global Operation accounting legacy system to Oracle Technology (2000).
- Technical lead for proposing Oracle On-line Marketing package to SBC (2001).
- Prepared various proposals for Electric Utilities, Energy Trading companies, Independent System Operators (ISO), and the Electric Power Research Institute (EPRI) (1998 –2001).
- Helping Oracle Sales Force understand the electric industry business and practices and support them to gain customers' trust in Oracle's understanding of the electric business requirements (1999-2001).
- Providing technical support for Oracle Marketing and Sale in the area of data warehousing and Oracle decision support tools (Reports, Discoverer, Express) for the electric power industry (1999-2001).
- Contributed to various proposals for many investors and electric utilities in different areas of power systems transmission and generation (1999-2000).
- Prepared and presented thermal Unit Commitment demos to various potential customers and responded to their technical questions and concerns in the area of short-term scheduling (1994-1998).
- Conducted training sessions on thermal Unit Commitment (1996-1997).

TECHNICAL PROFICIENCIES

Power System Industry:

- **Deregulation**: Integrated Forward markets, and Real time electricity markets for ISOs, Bidding Evaluation for Gencos, future market clearing price, location evaluation for new generators and their impact on the inter-regional power transfers, Power Trading and Marketing, Energy Risk Management, ISO and Power Exchange operations, Transmission Reservation and OASIS application, NERC E-Tagging system, Transaction Scheduling system, Imbalance Energy application, Transmission Congestion Management and Pricing.
- **Base Power Applications**: AGC, economic dispatch, reserve monitoring
- **Transmission Network Applications**: power flow, optimal power flow, reactive power optimization, transmission impact studies for new generation and re-powering, real-time network modeling, state estimator, contingency analysis

- **Generation Scheduling Applications**: Unit Commitment, Load Forecast, Hydro-Thermal Coordination, Transmission Security Constrained and Co-optimization of energy and AS services.
- **System Analysis**: transient Analysis, short circuit current calculations

Technology

- **Software, Tools & Languages**: Oracle Developer 2000+ including Oracle Forms, Reports and Graphics; Oracle Discoverer, Oracle Express, Oracle Designer, Data warehouse AppsBuilder, Matlab, Mathcad, Fortran 90, Pro*Fortran, C, Pro*C, C++, PL/SQL, JAVA, Oracle Jdeveloper, DHTML
- **Database Experience:** Oracle Database Administration for Oracle 7.x, Oracle 8i, Develop Database Applications with JAVA, MS SQL 2000.
- **Operating Systems**: VAX/VMS, UNIX, Windows NT, 2000, XP.
- **Oracle Application Server**: Develop Database applications with JAVA, Develop Web-based Applications with JAVA
- **System Architecture Design:** Client/Server, Network Computing, Message Oriented Middleware (MOM) Technology and Oracle Advanced Queuing

ACADEMIC ACHIEVEMENTS

Ph.D. in Electrical Engineering, Illinois Institute of Technology, Chicago, Illinois, December 1993
Thesis: ***Application of Fuzzy Sets to Power Systems Operation and Planning***

M.Sc. in Electrical Engineering, Kuwait University, Kuwait, June 1990
Thesis: ***Abnormal Transients in Power Transformers***

B.Sc. in Electrical and Computer Engineering, Kuwait University, Kuwait, June 1986
Project: ***Series Compensation of Overhead Transmission Lines.***

Adjunct Professor, (Jan 1999 – June 2002)
Electrical and Computer Engineering Department at Illinois Institute of Technology (**IIT**), Chicago, IL:

- Teaching courses on electric utility restructuring and the challenges of power systems operation and planning in the new deregulation marketplace.

Teaching Experience:
Taught the following courses at Illinois Institute of Technology (**IIT**), Chicago, IL:

- Electric Machinery (ECE Undergraduate course at IIT, 1994,1999)
- Advanced Methods in Power Systems (ECE Graduate & Undergraduate course at IIT, 1999)
- Deregulation of the Electric Utility Industry (ECE Graduate course at IIT, 2000)
- Power Systems Planning in Regulated and Deregulated Environment (ECE Graduate course at IIT, 2001)

PUBLICATIONS

Refereed Journals:

- "A Fuzzy-Based Optimal Reactive Power Control," ***IEEE Transactions on Power Systems***, Vol. 8, No. 2, pp. 662-670, May 1993 (*principal author*)
- "Reactive Power Optimization Using Fuzzy Load Representation," ***IEEE Transactions on Power Systems***, Vol. 9, No. 2, pp. 898-905, May 1994 (*principal author*)
- "Application of Fuzzy Sets to Optimal Reactive Power Planning with Security Constraints," in **Proceedings of the IEEE 1993 Power Industry Computer Application (PICA)** Conference, pp. 124-130, Scottsdale, AZ, May 1993, Also in the ***IEEE Transactions on Power Systems***, Vol. 9, No. 2, pp. 589-597, May 1994 (*principal author*)
- "Static Security in Power System Operation with Fuzzy Real Load Conditions," ***IEEE Transactions on Power Systems***, Vol. 10, No, 1, pp. 77-87, Feb. 1995 (*principal author*)
- "AI Approach to Optimal Var Control with Fuzzy Reactive Loads," ***IEEE Transactions on Power Systems***, Vol. 10, No. 1, pp. 88-97, Feb. 1995 (*principal author*)
- "Effect of EMF on Minimum Cost Power Transmission," in Proceedings of the IEEE Transmission & Distribution (**T&D**) Conference, pp. 627-633, Chicago, IL, April 1994, Also in the ***IEEE Transactions on Power Systems***, Vol. 10, No. 1, pp. 347-355, Feb. 1995 (*principal author*)
- "A Practical Resource Scheduling with OPF Constraints," in **Proceedings of the IEEE 1995 Power Industry Computer Applications (PICA)** Conference, pp. 92-97, Salt Lake City, Utah, May 1995, Also in the ***IEEE Transactions on Power Systems***, Vol. 11, No. 1, pp. 254-259, Feb. 1996 (*principal author*)
- "Spot Pricing of Capacities for Generation and Transmission of Reserve in an Extended Poolco Model," Accepted for Publications in the ***IEEE Transactions on Power Systems***, 1997 Winter Meeting (co-author)
- "Short Term Generation Scheduling in Photovoltaic-Utility Grid with Battery Storage", in **Proceedings of the IEEE 1997 Power Industry Computer Applications (PICA)** Conference, Columbus, OH, Also to appear in the ***IEEE Transactions on Power Systems*** (co-author)
- "Use of Simulators in Testing New Electricity Markets", in **IEEE PES 2009 Proceedings**, Calgary, Alberta, Canada (co-author)

Proceedings of Refereed Conferences:

- "Optimal Reactive Power Dispatch with Fuzzy Variables," in Proceedings of the **IEEE 1993 International Symposium on Circuits and Systems (ISCS)**, pp. 2188-2191, Chicago, IL, May 1993 (*principal author*)
- "Application of Artificial Intelligence to Optimal Var Control in Electric Power Systems," in **Proceedings of Expert System Applications for the Electric Power Industry Conference**, Phoenix, AZ, December 1993 (*principal author)*
- "On the Exact Computation of Some Typical Transient and Dynamic Phenomena in Power Networks Including Steel-Core Transformers," in **Proceedings of the IEEE Industrial & Commercial Power Systems Conference (ICPS)**, pp. 61-69, Irvine, CA, May 1994 (*principal author*)

- "Application of Distributed Computing for Resource Scheduling," in **Proceedings of the 1996 American Power Conference** (**APC**), pp. 1284-1289, Chicago, IL., April 1996 (*principal author*)

Others:
- "An Augmented Short Term Generation Scheduling in a Constrained Power Network", Presented in response to invitation from the **Advanced Operation Methods Subcommittee of the Power System Committee,** IEEE PES 1997 Winter Meeting, New York, NY, Feb. 1997 (*principal author*)

Research Projects Completed:
- Develop Energy and Ancillary Services Bidding Strategies for GENCOs in Deregulated Power Markets
- Data Warehouse and Decision Support Tools Requirement for the Operation of Independent System Operators (ISOs).
- Business Requirements for Transmission Providers in the Area of Transmission and Energy Scheduling
- API Development for the Integration of the Electric Power Research Institute (EPRI) Topology Processing Application to the Common Information Model (CIM) based Oracle Database.
- Detailed Functional Requirements for Energy Trading in USA and EMEA.
- Price Based Unit Commitment with generation and demand bids
- Effect of Generation and Transmission of Reserve on Spot Prices
- Unit commitment in a Distributed Environment
- Incorporation of the Network Constraints in Unit Commitment
- Unit Commitment Study With Ramping Constraints for Common Wealth Edison Company (ComEd)
- Optimal Power Flow With Electro-Magnetic Fields Constraints
- Application of Fuzzy Sets to Power Systems Operation and Planning
- Applications of Neural Networks and Expert Systems to Optimal VAR Control with Fuzzy Reactive Loads
- Abnormal Transients in Power Transformers

Seminars Attended:
- IEEE 1993 International Symposium on Circuits and Systems (ISCS), Chicago, IL, May 1993
- IEEE/PES Winter Meeting, New York, New York, Jan/Feb 1994
- IEEE Transmission & Distribution (T&D) Conference, Chicago, IL, April, 1994
- American Power Conference (APC), Chicago, IL, April 1996
- IEEE Advanced Operation Methods Subcommittee Meeting, IEEE/PES 1997 Winter Meeting, New York, NY, Feb. 1997
- IEEE 1997 PICA Conference, Columbus, OH, 1997
- IEEE 1999 PICA Conference, Santa Clara, CA, May 1999
- NERC TagMart Conference, Dallas, TX, Feb 1999
- EPRI CCAPI Workshop, Las Vegas, NV, Mar 1999

- EPRI CCAPI Workshop, San Francisco, CA, June 1999
- NERC Common Power System Modeling III Meeting, Chicago, IL., Oct 1999
- Power Marketing 2000 Conference, Arlington, VA, Nov 1999
- Johnson Control Company Meeting, Milwaukee, WI, Dec 1999
- ISO's CIO Council Meeting, Indianapolis, IN, May 2000
- Congestion Forecasting & Pricing Conference, Chicago, IL, Jun 2000

Participation in Thesis Committees:

- Ph.D. Thesis Committee, "Transmission and Generation Maintenance Scheduling with Different Time Scales in Power Systems" by M.K.C. Marwali, Illinois Institute of Technology, Chicago, IL 1998.
- Ph.D. Thesis Committee, "Decomposition Approach to Unit Commitment with Reactive Power Constraints" by H. Ma, Illinois Institute of Technology, Chicago, IL 1999.

Appendix 2

California ISO Your Link to Power	Version No.	1.0
	Version Date	2/25/2008
Externally-authored document cover sheet	Effective Date: 4/03/2008	

The purpose of this cover sheet is to provide attribution and background information for documents posted to the California ISO website that were not authored by CAISO.

Project Name	**Convergence Bidding**
Author Company	Siemens
Author Name	Ashmin Mansingh, Bogdan Vesovic, Jim Frame
Author Title	Application Design Leads
Title of document	**California ISO** Convergence Bidding **Technical Challenges**
Date submitted	8/13/2009
Other Comments	
Notes	

This document was submitted to the California Independent System Operator (CAISO) for posting to the CAISO website in conjunction with a Stakeholder-involved initiative or similar activity.

The document was not produced by the CAISO and therefore does not necessarily reflect its views or opinion.

SIEMENS

California ISO

Convergence Bidding

Technical Challenges

SIEMENS

Table of Contents

SIEMENS

1. Convergence Bidding - Implementation Challenges

In response to Ca ISO request for assessment of complexity and schedule of the cited topic, Siemens is providing this short technical paper on some challenges that are seen in implementation of Convergence Bidding. This document corresponds to "Straw Proposal for the Design of Convergence Bidding" prepared for discussion at Stakeholder Meeting on July 9, 2009.

In general, we find existing experience with virtual bidding in other ISOs with regard to Nodal, Full Network Model, and Full AC solution based implementation, not long enough to warrant a quick implementation and testing for Convergence Bidding with respect to all specifics of California Power System and current Market Design

With respect to the relative order of the changes being done to the Market, Siemens feel that the logical order for a controlled implementation, deployment, and testing will be:

- Core set of changes (Multistage Generators modeling) to conclude the solution engine changes
- Pricing related immediate needs (Scarcity Pricing) to conclude on essential Real-Time Market pricing impacting changes
- Market Place need (Convergence Bidding) and changes

With respect to the topic of Convergence Bidding, here are the implementation challenges Siemens is observing, in reference to the Straw Proposal.

2. Impact on Network Power Flow

- AC solution divergence by over-scheduling virtual demand or supply
- Issue of slack power distribution to virtual bids. It may be useful to consider the interaction between virtual bidding and distributed load slack processing. When items such as shift factors and loss sensitivities are calculated they are determined relative to a slack power mechanism. In particular the distributed load slack mechanism adjusts loads based on distribution factors calculated based on an individual load's percentage of the overall load. When one includes the option of virtual bidding it raises the question as to whether or not virtual demand bids should participate in the distributed load slack mechanism. Siemens recommends continuing to use the distributed load slack mechanism with virtual demand bids being excluded from participation in the slack adjustments.
- Treatment of Contingencies isolating virtual bids (currently we do not allow contingency to isolate a physical resource). On the current MRTU system any contingencies that result in the loss of physical generation or physical load are treated as "Monitor Only" contingencies. This means that the contingency will be analyzed by the Network Applications software and any violations will be reported in the NA summaries. However, there will not be any constraints corresponding to any post-contingency violations sent to the SCUC engine. Part of the thinking behind this was that the potential exists that base case MW values for resources could be restricted to prevent post-contingency violations. This could result in the situation where the full output of a resource that was bid into the market could be curtailed below its bid in maximum due to the outage of a different resource in the region. It was not clear that this was an

acceptable outcome. For one thing it seems to potentially shift the risk associated with the outcome from a resource outage from the resource owner to the ISO. It also seems possible that this could be a double counting of the potential impact of resource outages with the regional reserve requirements. With this as background, it raises the question of whether or not the same approach should be used in the situation where a contingency would outage (either directly or indirectly) a virtual bid. In other words, if a contingency results in the "outage" of a virtual bid should that contingency be treated as a "Monitor Only" contingency?

- Congestion clearing by virtual bids that would not materialize in RTN

3. Position Limits

- Additional burden on SIBR to implement those limits: More data collection and interface infrastructure is required to transfer required data to SIBR. Alternatively they might be implemented in IFM, but that would require additional design effort for functionality that is planned to be phased out.
- Challenge to calculate position limits for nodes without resources (if virtual bidding is allowed on all Market connectivity nodes). Especially if trading hub virtual bids are distributing MW quantities to non-resource nodes.
- Position limits depending on rated capacity and not unreserved capacity might be inefficient for interties that are heavily reserved through transmission rights

4. Delivery Schedule

- Changes in MPM, IFM and RUC applications due to convergence bidding are coming on the top and parallel to number of other complex features being implemented.
- Number of design issues will need to be clarified, bringing additional risk to short delivery schedule
- Experience with implementation and Market Simulation might bring additional design and functionality changes. Opportunities for virtual bidding to cause local mitigation of physical resources, etc. might cause rethinking of certain features
- Sizing of the problem might require software alterations and tuning

5. Market Simulation Duration

- It is difficult to estimate what is the right duration of Market Simulation period, during which Market Participants and ISO should familiarize and learn from day to day virtual bidding patterns and simulated operational issues under different conditions (winter, summer, number of contingency scenarios, etc.)
- During market simulation period DAM and RTN markets have to run in lockstep in order to get the full benefit of market trials (correct price differential between DAM and RTN clearing). This requires more emphasis, participation, and commitment towards coordination of DAM and RTN bids for various simulated scenarios from the Market Participants.

6. Sizing and Impact on Hardware

- Potentially large number of bids and virtual resources requires more working memory and storage space, from SIBR to Market Applications down to Settlements.
- If the number of virtual bids is unlimited, then the highly automated participants can generate large virtual bid volumes causing additional strain on front-end systems as well as on messaging interface mechanisms (web services) throughout the system
- Current recommendation is to have MPM running against bid-in load instead of load forecast and to preserve existing automatic RRD process. That would introduce two additional runs to DAM. Irrespective of sequential or parallel execution of these MPM and RRD runs, that would put pressure on existing DAM execution timeline and might require more computing resources.

7. Impact on RTN Market

- The impact of DAM convergence bidding to RTN operation should be carefully verified and understood during Market Simulation phase. Specifically:
  - There is potential of IFM clearing large volume of virtual load with physical generation, causing large amount of generation minimum load to be online and getting binding instructions in RUC, consequentially causing similar over-generation conditions in RTN.
  - Analogously, if large amount of physical load in IFM is cleared by virtual generation, and there is not sufficient RA capacity in RUC from non-committed physical generation, we might lack sufficient binding instructions and particularly commitment from long start resources in RTN. This can cause under-generation condition in RTN.
  - Congestion (interties, flowgates or nomograms) cleared by virtual bidding in DAM might not be manageable in RTN operations.

8. Impact on Solution Performance and Quality

- Large number of virtual bids can bring scenarios where, in absence of virtual supply but presence of virtual demand, it can introduce difficult to solve physical generation ramp constrained scenarios
- Large number of virtual bids that are cleared in first unconstrained unit commitment can cause heavy congestion that is not only difficult to resolve, but also the original unconstrained solution used for MIP hot start might be more of a performance impediment than contributor
- Large number of big MW quantity bids (like bidding thousands of MWs on trading hubs) can deteriorate numerical integrity of the optimization problem
- Large number of virtual bids that might be priced similarly might increase the search time for optimal solution

9. Adopting Best Practice

- Siemens intends to implement this change based on the lessons learned from the experience of other Markets running Convergence Bidding with Full AC Network solution and Nodal Convergence Bidding.
- Siemens intends to provide parameters to be tuned during the Market Simulation to proceed in a controlled manner in which learning and needed adjustments can be provided.
  - Position limits per Virtual Bid:
    - Minimum MW quantity
    - Maximum MW quantity depending on location
  - Position limits per Scheduling Coordinator:
    - Maximum MW quantity depending on location
    - Number of Virtual bids
  - CB limits per Market run:
    - Maximum MW quantity of internal Ca ISO virtual supply and demand
    - Maximum MW quantity of external Ca ISO virtual supply and demand
    - Number of Virtual bids
  - Optional use of AC or DC power flow in DAM for runs (MPM, IFM) involving CB
  - Optional use of Virtual bids in DAM runs

ATTACHMENT D

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	))	**Docket No. ER06-615-___**

DECLARATION OF MARGARET MILLER ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

I. Introduction

Q. Please state your name and business address.

A. My name is Margaret Miller. My business address is 151 Blue Ravine Road, Folsom, California 95630.

Q. By whom and in what capacity are you employed?

A. I am employed as Senior Market Design and Policy Specialist for the California Independent System Operator Corporation ("ISO"). In that position, I am responsible for the development of regulatory policies and new market initiatives related to wholesale market design.

Q. Please describe your professional and educational background.

A. I have worked in the electric power industry for over ten years. Between 1997 and 1999, I was a Client Relations Representative for the ISO. From 1999 to 2000, I served as a Portfolio Analyst for PG&E Energy Services. I was a Product Consultant for Silicon Energy Software from 2000 to 2002. In 2003, I returned to the ISO as Lead Engineering Specialist, in which position I served as a Subject

Matter Expert for the ISO's market redesign and technology upgrade project. I began in my current position in 2007. I received a Bachelor of Arts degree from the University of California, Santa Barbara in 1990 and a Master of Business Administration degree from the University of San Francisco in 2002.

Q. What is the purpose of your declaration in this proceeding?

A. I will discuss the history of the stakeholder process to develop the policy component of the convergence bidding design, and the ISO's current schedule for implementing that policy.

II. The Convergence Bidding Stakeholder Process and the Schedule for Putting Convergence Bidding Policy Into Effect

Q. Can the convergence bidding development activities be divided into any component activities?

A. Yes. There are two separate but related components of the convergence bidding development activities. The first of these is the software component, which is being developed by the ISO and its software vendor, Siemens Energy, Inc. The second component concerns the convergence bidding policy, which the ISO has developed through a stakeholder process. I will discuss the policy component and Janet Morris discusses the software component in her declaration.

Q. Can the events in the stakeholder process you describe be categorized based on a timeline?

A. Yes. The events in the stakeholder process can be categorized as falling into three successive time periods: (1) convergence bidding development activities that took place from June 2006 to the end of 2008; (2) the temporary suspension of the convergence bidding stakeholder process from the end of 2008 to June 2009; and (3) the resumption of convergence bidding development activities in May 2009 and the continuation of those activities until convergence bidding is implemented no later than February 1, 2011. These three time periods basically correspond to the three time periods regarding the software component that Ms. Morris addresses.

Q. What policy development activities regarding convergence bidding took place during the time period from June 2006 until the end of 2008?

A. A number of policy development activities occurred during that time period. They included the following:

- Stakeholder meetings and conference calls held in June 2006, October 2006, June through September of 2007, November 2007, February 2008, May 2008, July 2008, and October 2008.
- Numerous written stakeholder comments.
- Issuance of a series of white papers on convergence bidding prepared by the ISO.
- Presentations given by representatives of other independent system operators and regional transmission organizations regarding the convergence bidding rules and experiences of those entities.

Q. Were there any significant convergence bidding issues that the ISO determined could only be resolved after the new ISO market went into effect?

A. Yes. A fundamental convergence bidding design issue concerns the spatial granularity of convergence bids, *i.e.*, whether convergence bidding should be conducted on a zonal basis or on a nodal basis. There was significant debate in the stakeholder process regarding whether convergence bids could be submitted at each node or whether convergence bids should only be submitted, at least initially, at the level of Load Aggregation Points (*i.e.*, on a zonal basis). The ISO determined that the decision of whether convergence bidding should be designed on a zonal or a nodal level needed to be deferred until after implementation of the new ISO market, in order to give the ISO and stakeholders an opportunity to review actual market data that would provide information about price divergence between the day-ahead and real-time markets. This market data would inform the essential decision of whether convergence bidding should be designed on a zonal or a nodal basis.

Q. When did the ISO inform stakeholders that the decision regarding zonal versus nodal pricing would need to be postponed until after start-up of the new ISO market?

A. The ISO first provided that information to stakeholders in 2007 and subsequently repeated it, as documented in materials posted on the ISO's website.

Q. Even in light of that information, did the ISO intend to resolve the remaining convergence bidding policy issues prior to start-up?

A. Yes. The ISO had intended to resolve all remaining policy issues before start-up and continued to engage with stakeholders until the October 2008 meeting. That proved to be the last convergence bidding stakeholder meeting prior to start-up, though it was not intended to be the last meeting. The reason it became the last meeting before start-up was that soon after the October 2008 meeting the ISO and stakeholders became fully occupied with the effort to ensure the launch of the new ISO market. At the time of the October 2008 meeting, the ISO had targeted January 31, 2009 as the start-up date. Over the following few months, the targeted start-up date was adjusted first to March 1, 2009, and then to March 31, 2009, the date that the new ISO market was in fact implemented.

Q. Were any significant convergence bidding issues resolved through this stakeholder process by the end of 2008?

A. Yes. A number of issues were largely resolved during these discussions with stakeholders, including: (1) the basic characteristics of convergence bids, (2) the basic elements of the credit policy applicable to convergence bids, and (3) a proposal to address scheduling incentives regarding seller's choice contracts.

Q. Did any significant convergence bidding issues remain to be resolved?

A. Yes. As of late 2008, other significant issues concerning the design of convergence bidding remained unresolved. The discussions at the meetings and

on the conference calls revealed significant disagreements over a number of issues, most notably the spatial granularity of convergence bids (*i.e.*, whether virtual bids could be submitted on a nodal basis or on a zonal basis) and the allocation of Bid Cost Recovery uplift charges to convergence bidders.

Q. Please describe the temporary suspension of convergence bidding development activities from the end of 2008 to June 2009.

A. During that time period, the resources of the ISO and its stakeholders were devoted to a successful market start-up, both in the months prior to the March 31, 2009, go-live date and in the months after March 31 when the ISO and market participants were gaining experience with the operation of the new ISO market. Due to those needed resource commitments, it was not practicable to resume the convergence bidding stakeholder process during that time.

Q. Please describe the resumption of the convergence bidding stakeholder process.

A. After ensuring that the implementation of the new ISO market was successful, the ISO was also able to turn back to the convergence bidding stakeholder process. At the ISO's 2009-2011 Release Planning Workshop held on June 24, 2009, the ISO provided to stakeholders a proposed schedule for developing and implementing convergence bidding based on the resumption of the stakeholder process and software development. The ISO's schedule for convergence bidding has continued to be refined in the months since June, based in part on

the input of stakeholders. The convergence bidding schedule was again discussed with stakeholders at the ISO's Release Planning Implementation stakeholder meeting held on August 19, 2009.

The ISO resumed the stakeholder process on the policy elements of convergence bidding design in July of this year, with the publication of its "Straw Proposal for Design of Convergence Bidding," dated July 2, 2009. This presentation was discussed at a convergence bidding stakeholder meeting on July 9, 2009. Additional stakeholder meetings on the convergence bidding design were held on August 13, August 27, September 9, September 18, and October 9, 2009. Also, on September 18, the ISO Market Surveillance Committee held a joint meeting with stakeholders to discuss the convergence bidding design. On September 14, in anticipation of the September 18 stakeholder meeting, the ISO posted on its website its draft final proposal for the convergence bidding design. On October 2, the ISO posted an addendum to the draft final proposal for discussion at the October 9 stakeholder meeting. The ISO Board of Governors approved the convergence bidding design policy at its October 29, 2009 meeting.

A more detailed listing of key dates in the convergence bidding stakeholder process, from 2006 until 2009, is provided in Appendix 1 to my declaration.

Q. Are there separate components to the ISO's current convergence bidding development and implementation schedule?

A. Yes. There are two tracks to ISO's current schedule for the development and implementation of convergence bidding. One track involves the documentation of the convergence bidding design policy in tariff provisions and business practices. The other track concerns the design, development, testing, and simulation of the software modifications to implement convergence bidding. I will discuss the first track. In her declaration, Ms. Morris describes the second track.

Q. What are the key upcoming events and dates regarding the first track you describe?

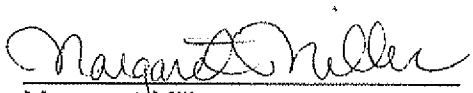
A. The ISO's current schedule regarding the first track calls for the following events and associated dates:

- December 2009 - February 2010 – Development of tariff language to implement convergence bidding
- December 2009 – Publication of external business requirements (Scheduling Infrastructure Business Rules already published but subject to updating)
- First Quarter 2010 – Submission of tariff language to implement convergence bidding for Commission approval (the specific filing date will depend on the date the Commission issues an order on the ISO's convergence bidding design policy and whether that order requires any significant modifications to the design policy)
- Second Quarter 2010 – Publication of convergence bidding technical specifications
- Third Quarter 2010 – Development of material for inclusion in the ISO's Business Practice Manuals ("BPMs"), including the BPMs for Compliance Monitoring, Definitions and Acronyms, Market Instruments, Market Operations, and Settlements and Billing.

Q. Does this conclude your declaration?

A. Yes, it does.

I affirm under penalty of perjury that the foregoing statements are true and correct to the best of my knowledge, information, and belief.



Margaret Miller

Executed this 20th day of November, 2009.

Appendix 1

Key Dates in Convergence Bidding Stakeholder Process

Date	Event/Due Date
May 31, 2006	Market Surveillance Committee ("MSC") hosts meeting that includes MSC presentation entitled "Convergence Bidding and Scheduling Requirements" and discussion on convergence bidding issues
June 1, 2006	ISO issues white paper entitled "Convergence Bidding Fundamentals" and MSC issues paper entitled "Convergence Bidding and the Enforcement of Day-Ahead Commitments in Electricity Markets" for discussion at June 13, 2006, tutorial and panel discussion
June 13, 2006	ISO holds convergence bidding tutorial and panel discussion that includes ISO presentation entitled "Convergence Bidding," MSC presentation entitled "Too Many Prices? Virtual Bidding, Scheduling Requirements and Strategic Behavior in Multi-Settlement Markets," presentations by stakeholders, and discussion on convergence bidding issues
July 17, 2006	ISO issues paper entitled "Working White Paper on Design Criteria for Convergence Bidding" for discussion at July 18-19, 2006, stakeholder meeting
July 18-19, 2006	ISO hosts market initiatives stakeholder meeting that includes discussion on convergence bidding issues
July 28, 2006	Due date for written stakeholder comments on matters discussed at July 18-19, 2006, stakeholder meeting
August 8, 2006	MSC holds meeting that includes ISO presentation entitled "Convergence Bidding Design Framework" and discussion on convergence bidding issues
August 14, 2006	ISO issues paper entitled "Revised Working White Paper on Design Criteria for Convergence Bidding"
August 17, 2006	ISO hosts market initiatives stakeholder meeting that includes ISO presentation entitled "Convergence Bidding Design Framework" and discussion on convergence bidding issues
September 6, 2006	ISO hosts conference calls with representatives from the New York ISO and ISO New England to discuss their experiences with virtual bidding
September 8, 2006	ISO hosts conference call with representatives from PJM to discuss its experience with virtual bidding
September 18, 2006	MSC hosts meeting that includes ISO presentation entitled "Convergence Bidding Design: Focus on Three Elements" and discussion on convergence bidding issues
October 24, 2006	Department of Market Monitoring ("DMM") issues paper entitled "Convergence Bidding: Market Monitoring and

Date	Event/Due Date
	Mitigation Issues" for discussion on October 30, 2006, conference call
October 26, 2006	ISO issues revised "Working White Paper on Design Criteria for Convergence Bidding" for discussion on October 30, 2006, conference call
October 30, 2006	ISO hosts conference call that includes ISO presentation entitled "Convergence Bidding Core Elements of Design," DMM presentation entitled "Comments and Recommendations on Convergence Bidding Design Options," and discussion on convergence bidding issues
November 13, 2006	MSC hosts meeting that includes ISO presentation entitled "Elements of Convergence Bidding Design: Credit and Cost Allocation Issues" and discussion on convergence bidding issues
November 15, 2006	Due date for written stakeholder comments on matters discussed on October 30, 2006, conference call
May 31, 2007	ISO issues papers entitled "Key Elements for the Conceptual Proposal for Convergence Bidding in the MRTU Markets" and "Review of Settlement Charges for Convergence Bidding Cost Allocation" for discussion at June 6, 2007, meeting
June 4, 2007	ISO issues paper entitled "Comparison of Credit Requirements for Virtual Bidding" for discussion at June 6, 2007, meeting
June 6, 2007	ISO hosts joint MSC/stakeholder meeting that includes ISO presentation entitled "Conceptual Design for Convergence Bidding" and discussion on convergence bidding issues
June 13, 2007	Due date for written stakeholder comments on matters discussed at June 6, 2007, meeting
June 22, 2007	ISO issues paper entitled "Addendum to May 31 Paper: Key Issues Related to Credit Policy for Virtual Bids" for discussion on June 29, 2007, stakeholder conference call
June 29, 2007	ISO hosts stakeholder conference call that includes ISO presentation entitled "Convergence Bidding: Credit and Collateral Issues" and discussion on convergence bidding issues
July 17, 2007	ISO hosts stakeholder conference call that includes ISO presentation entitled "Convergence Bidding – Granularity of Virtual Bids" and discussion on convergence bidding issues
August 7, 2007	ISO issues paper entitled "Options for the Conceptual Design for Convergence Bidding" for discussion at August 10, 2007, meeting
August 10, 2007	ISO hosts joint MSC/stakeholder meeting that includes

Date	Event/Due Date
	MSC presentation entitled "Convergence Bidding Issues," DMM presentation entitled "Comments and Recommendations on Convergence Bidding Design Options," stakeholder presentations, and discussion on convergence bidding issues
August 24, 2007	Due date for written stakeholder comments on matters discussed at August 10, 2007, meeting
September 12, 2007	ISO hosts stakeholder meeting that includes ISO presentations entitled "Convergence Bidding Credit Policy" and "Status of Convergence Bidding Design," DMM presentation entitled "Recommendations on Convergence Bidding" and discussion on convergence bidding issues
September 19, 2007	Due date for written stakeholder comments on matters discussed at September 12, 2007, stakeholder meeting
November 7, 2007	ISO issues paper entitled "Update on the Design for Convergence Bidding" and DMM issues paper entitled "Convergence Bidding: Department of Market Monitoring Recommendations" for discussion at November 14, 2007, stakeholder meeting
November 14, 2007	ISO hosts stakeholder meeting that includes ISO presentations entitled "Update on the Design for Convergence Bidding," "Convergence Bidding Design – Proposed Credit Policy," "Convergence Bidding Design – Cost Allocation," and "Nodal Convergence Bidding and Seller's Choice," and discussion on convergence bidding issues
November 30, 2007	Due date for written stakeholder comments on matters discussed at November 14, 2007, stakeholder meeting
February 1, 2008	ISO issues paper entitled "Straw Proposal for Convergence Bidding Cost Allocation" for discussion at February 8, 2008, meeting
February 8, 2008	ISO hosts joint MSC/stakeholder meeting that includes ISO presentation entitled "Cost Allocation for Convergence Bids" and discussion on convergence bidding issues
February 29, 2008	Due date for written stakeholder comments on matters discussed at February 8, 2008, meeting
May 2, 2008	ISO hosts stakeholder meeting that includes presentations by representatives from ISO New England regarding its experience with virtual bidding, and discussion on convergence bidding issues
July 23, 2008	ISO hosts stakeholder meeting that includes presentations by representatives from the Midwest ISO regarding its experience with virtual bidding, and

Date	Event/Due Date
	discussion on convergence bidding issues
October 9, 2008	ISO issues paper entitled "Two Tier Real-Time Uplift" for discussion at October 16, 2008, stakeholder meeting
October 10, 2008	ISO issues white paper entitled "Convergence Bidding Resource IDs" for discussion at October 16, 2008, stakeholder meeting
October 16, 2008	ISO hosts stakeholder meeting that includes ISO presentations entitled "Policy Discussion: Virtual Bids at Ties & Hubs, and Information Release About Virtual Bids," "Two-Tier Real-Time Bid Cost Recovery," "Finalizing Convergence Bidding Policy Development," "MAP (Markets and Performance) Update," and "Resource IDs for Convergence Bidding," ISO issuance of draft "SIBR Business Rules for Market and Performance (MAP)," stakeholder presentations, and discussion on convergence bidding issues
October 31, 2008	Due date for written stakeholder comments on matters discussed at October 16, 2008, stakeholder meeting
June 24, 2008	ISO hosts release planning workshop with stakeholders that includes discussion on implementation of convergence bidding
July 2, 2009	ISO issues paper entitled "Straw Proposal for the Design of Convergence Bidding" for discussion at July 9, 2009, stakeholder meeting
July 9, 2009	ISO hosts stakeholder meeting that includes ISO presentation entitled "Straw Proposal for Design of Convergence Bidding" and discussion on convergence bidding issues
July 24, 2009	DMM issues "Comments on Straw Proposal for the Design of Convergence Bidding"; due date for written stakeholder comments on matters discussed at July 9, 2009, stakeholder meeting
August 13, 2009	ISO hosts stakeholder conference call that includes ISO presentations entitled "Convergence Bidding SC Certification Requirements," "GMC Charges to Convergence Bids," and "Convergence Bidding – Allocation of IFM and RUC Tier 1 BCR Uplift," ISO issuance of examples of Integrated Forward Market ("IFM") Bid Cost Recovery ("BCR") and Residual Unit Commitment ("RUC") BCR allocation to convergence bidders, and discussion on convergence bidding issues
August 18, 2009	DMM releases paper entitled "Congestion Revenue Rights Settlement Rule" for discussion on August 27, 2009, stakeholder conference call
August 19, 2009	ISO hosts release planning workshop with stakeholders

Date	Event/Due Date
	that includes discussion on implementation of convergence bidding
August 27, 2009	ISO hosts stakeholder conference call that includes ISO presentations entitled "Options for Bid Volume Limits," "GMC for Convergence Bidding," and "Impact of Virtual Bidding on RUC," and discussion on convergence bidding issues
September 2, 2009	Due date for written stakeholder comments on matters discussed on August 27, 2009, stakeholder conference call
September 3, 2009	ISO begins series of biweekly meetings (scheduled to end by December 3, 2009) of Convergence Bidding Working Group to discuss technical issues associated with convergence bidding
September 9, 2009	ISO hosts stakeholder conference call that includes ISO presentation entitled "Convergence Bidding on the Interties" and discussion on convergence bidding issues
September 14, 2009	ISO issues paper entitled "Draft Final Proposal for the Design of Convergence Bidding" for discussion at the September 18, 2009, stakeholder meeting
September 18, 2009	ISO hosts joint MSC/stakeholder meeting that includes ISO presentations entitled "Draft Final Proposal for Design of Convergence Bidding," "Convergence Bidding on the Interties," and "Cost Allocation for Convergence Bids," DMM presentations entitled "CRR Settlement Rule Under Convergence Bidding" and "Local Market Power Mitigation Under Convergence Bidding," and discussion on convergence bidding issues
October 2, 2009	ISO issues paper entitled "Addendum to the Draft Final Proposal for the Design of Convergence Bidding" and DMM issues paper entitled "Local Market Power Mitigation Options Under Convergence Bidding" for discussion at October 9, 2009, stakeholder meeting; due date for written stakeholder comments on matters discussed at September 18, 2009, meeting
October 6, 2009	DMM issues paper entitled "Illustrative Examples of Alternative Local Market Power Mitigation" for discussion at October 9, 2009, stakeholder meeting
October 9, 2009	ISO hosts stakeholder meeting that includes ISO presentation entitled "Addendum to Draft Final Proposal for Design of Convergence Bidding," DMM presentations entitled "Local Market Power Mitigation Under Convergence Bidding" and "CRR Settlement Rule Under Convergence Bidding," and discussion on convergence bidding issues

Date	Event/Due Date
October 14, 2009	Due date for written stakeholder comments on matters discussed at October 9, 2009, stakeholder meeting
October 29, 2009	Following review of convergence bidding design policy by ISO Board of Governors and opportunity for stakeholder comments regarding convergence bidding issues, Board of Governors authorizes ISO to make all filings necessary to implement convergence bidding design policy

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon 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 Washington, D.C. this 20th day of November, 2009.

/s/ Bradley R. Miliauskas
Bradley R. Miliauskas