Exhibit No.*:*	_____
Issue:	Flaws in CRA International RTO cost-benefit study and additional CRA simulations
Witness:	Johannes P. Pfeifenberger
Sponsoring Party:	Midwest Independent Transmission System Operator, Inc.
Case No.:	Case No. EO-2008-0046

Case No. EO-2008-0046

MIDWEST INDEPENDENT TRANSMISSION SYSTEM OPERATOR, INC.

SUPPLEMENTAL REBUTTAL TESTIMONY

OF

JOHANNES P. PFEIFENBERGER

Cambridge, Massachusetts
December, 2007

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Aquila, Inc., d/b/a Aquila Networks – MPS and Aquila Networks – L&P for Authority to Transfer Operational Control of Certain Transmission Assets to the Midwest Independent Transmission System Operator, Inc.	))))))))	Case No. EO-2008-0046

AFFIDAVIT OF JOHANNES P. PFEIFENBERGER

COMMONWEALTH OF MASSACHUSETTS) ss. COUNTY OF MIDDLESEX)

Johannes P. Pfeifenberger, being first duly sworn on his oath, states:

1. My name is Johannes P. Pfeifenberger. I am presently a Principal and Director of The Brattle Group, which serves as consultant for Midwest Independent Transmission System Operator, Inc.

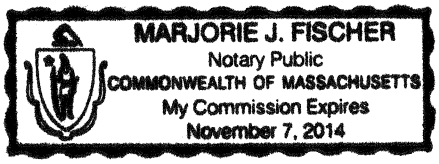
2. Attached hereto and made a part hereof for all purposes is my supplemental rebuttal testimony.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct to the best of my personal knowledge, information and belief.

Johannes P. Pfeifenberger

Subscribed and sworn before me this 27 day of December, 2007.

Notary Public for Middlesex County, Massachusetts
My Commission expires: 11/7/2014



BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

SUPPLEMENTAL REBUTTAL TESTIMONY OF
JOHANNES P. PFEIFENBERGER
ON BEHALF OF
MIDWEST INDEPENDENT TRANSMISSION SYSTEM OPERATOR, INC.
CASE NO. EO-2008-0046

I. INTRODUCTION

Q. Please state your name.

A. My name is Johannes P. Pfeifenberger.

Q. Are you the same Johannes P. Pfeifenberger who previously submitted rebuttal testimony in this case on behalf of the Midwest ISO?

A. Yes, I am.

Q. What is the purpose of your supplemental rebuttal testimony?

A. The purpose of my supplemental rebuttal testimony is three-fold. First, to correct a statement made in my rebuttal testimony based on evidence that was made available by Aquila's consultant, CRA International ("CRA"), subsequent to the filing of my rebuttal testimony. Second, to provide an update on the status of the additional production cost simulations referenced on page 20, lines 15 to 23, of my rebuttal testimony. Third, to provide supplemental information on the limitations and bias of the GE-MAPS model used to estimate production cost savings in the Aquila Study,[1] including the quantification of benefits associated with elimination of rate pancaking as discussed on page 5, lines 6 to 9, of my rebuttal testimony.

[1] As explained in my rebuttal testimony, "production costs" include the fuel, O&M, and purchased power costs.

II. REBUTTAL TESTIMONY CORRECTION

Q. On page 10, line 4 through page 11, line 12 of your rebuttal testimony you discuss certain limitations in the market simulations that caused the GE-MAPS model to over commit the Aries Plant in two of the three simulations. Does any portion of this discussion need corrected?

A. Yes. In this portion of my rebuttal testimony I attributed the unreasonable and uneconomic dispatch of the Aries plant in two of the three scenarios to the GE-MAPS model's failure to make available and account for (during the simulations' unit commitment stage) imports from Aquila's jointly-owned generating units that are located outside of its control area as well as imports from third-party sources. However, based on new information from CRA, the reason for the unreasonable Aries dispatch is not the model's inability to account for imports from both jointly-owned external units and third-party sources, but rather the simulations' inability to account (during the simulations' unit commitment stage) for imports from third-party (or market-based) sources that are less expensive than local resources. I consequently need to correct the response to the question on lines 4 and 5 of page 10 of my rebuttal testimony.

Q. How should the response to that question read to correct this issue?

A. The corrected response—with additions underlined and deletions shown in strike-through—should read in its entirety as follows:

"For the purpose of the Aquila Study, the market simulation software was configured such that only "pool-internal" and jointly-owned external resources are considered in the generation-commitment stage of the simulation. This configuration

simplifies the simulations and decreases the computer time needed to run the simulation software. However, this simplification ignores the fact that a particular "pool"—such as the Midwest ISO, SPP, or the Aquila control area in the "Aquila Stand Alone" case—may plan to be a net importer of power purchased from third parties during certain time periods. When such third-party or market-based imports are scheduled by a utility in advance so that they are already known during the generation commitment phase of control area operations, ~~—as is certainly the case for imports from Aquila's jointly-owned generation and contracted-for resources that are located outside of its control area—~~ these imports would be considered in the commitment process. Failure to consider these scheduled imports could result in over commitment of more expensive generating resources within the control area[2] as occurred in the "Aquila Stand Alone" and "Aquila in Midwest ISO" cases with respect to the Aries merchant plant.

~~This is particularly relevant in the Aquila Study because a very significant portion of Aquila's resources—about 470 MW of jointly owned units and long-term purchases—are located outside Aquila's Missouri control area (see Aquila Study, p. 38). The simplified modeling of "pool-based" unit commitment does not recognize the availability of these external resources in the Stand Alone and Midwest ISO cases. However, in the simulations for the "Aquila in SPP" case, Aquila's external resources are located within the boundary of the same "pool" (i.e., within SPP). As a consequence, the simulation model overcommitted the Aries merchant generating plant in the "Aquila Stand Alone" and the "Aquila in Midwest ISO" cases but not the "Aquila in SPP" case.~~ Because the

[2] ~~As used in this context the term imports or imported power applies to both the generation provided by units owned by Aquila but located outside of its control area as well as power purchased by Aquila from other utilities and/or merchant generators located outside its control area.~~

uneconomic dispatch of the Aries plant caused substantial uplift costs that were allocated solely to Aquila, this resulted in artificially and unrealistically inflated costs to Aquila in the "Aquila Stand Alone" and "Aquila in Midwest ISO" cases as compared to the "Aquila in SPP" case. The bottom line is that the Aquila Study incorrectly overstates the estimated benefits of Aquila being in SPP relative to the benefit of Aquila joining the Midwest ISO."

Q. Does the correction of your rebuttal testimony as noted above change your conclusions that: (1) the simulation model excessively and unnecessarily commits and dispatches the Aries merchant generating plant in two of the three scenarios, (2) the unrealistic commitment creates erroneously-added uplift costs in these two scenarios, and (3) correction of the unrealistic dispatch of the Aries merchant plant in these two scenarios invalidates the CRA Study findings of greater production cost benefits associated with participation in SPP as compared to participation in Midwest ISO?

A. No, it does not. The conclusions in my rebuttal testimony remain unchanged. As stated on page 16, lines 7 through 10 of my rebuttal testimony, "…the commitment and dispatch of the Aries plant in the 'Aquila Stand Alone' and 'Aquila in Midwest ISO' case is unrealistic – simply an artifact of the simulations performed. The much larger benefit attributed to participation in SPP consequently is not supported by the available evidence."

Q. Have you provided to any of the parties in this proceeding further evidence to support your conclusions?

A. Yes. In my response to Staff Data Request No. 6, which is attached as Schedule JPP-2, I further explained the matter of how the GE-MAPS simulations treated imports and provided additional evidence to document the fact that the Aries plant is committed and dispatched despite the fact that average production costs of Aries in the simulations exceed the price for energy that can be imported from other sources. As such, the uneconomic commitment and dispatch of the Aries plant in two of the three simulations, which is solely the result of modeling limitations, results in costs significantly in excess of available market-based purchases. As I explained in my rebuttal testimony, this substantially and erroneously overstates the Aquila Study's estimate of production cost savings for the "Aquila in SPP" case.

III. STATUS OF ADDITIONAL PRODUCTION COST SIMULATIONS

Q. On page 20, lines 15 through 23 of your rebuttal testimony, you stated that, at the time of filing, you did not have simulations that corrected the Aries commitment and dispatch distortions without removing the Aries pant from the model. Have you been able to obtain such simulations?

A. Yes, a set of revised simulations for 2008 with the Aries unit included has been completed by CRA for the "Aquila Stand Alone," "Aquila in Midwest ISO", and "Aquila in SPP" cases. However, while these revised simulations do, for the most part, resolve the modeling issues that led to excessive Aries commitment and dispatch in the original Aquila Study simulations, they brought to light additional modeling problems that render them unreliable and unsuitable to determine whether Aquila's production cost savings would likely be higher in the "Aquila in Midwest ISO" or the "Aquila in SPP" case.

Q. How do these revised 2008 simulations differ from the original Aquila Study simulations?

A. The differences are: (1) changing the GE-MAPS unit commitment algorithm from "pool commitment" to "system commitment" (so that the model can account for third-party or market-based imports during the unit commitment stage of the simulations); (2) exempting imports from Aquila's jointly-owned and contracted external generating resources from commitment and dispatch hurdle rates that the model otherwise imposes on any flows across pool boundaries; (3) imposing a hurdle rate on transactions between Aries and Aquila (so the simulations do not give an inappropriate preference to Aquila purchases from Aries over purchases from other third parties); (4) increasing the commitment hurdle rates so they exceed dispatch hurdle rates by $2/MWh (in recognition that the firm day-ahead imports needed for commitment purposes are more difficult and more expensive to arrange than real-time economy exchanges, which typically rely on less expensive non-firm transmission); (5) adjusting the commitment hurdle rate between PJM and the Midwest ISO so it is no higher than the dispatch hurdle rate between the two RTOs (in recognition of the fact that both RTOs operated coordinated day-ahead and real-time markets); and (6) implementing small dispatch and commitment hurdle rates between individual SPP control areas in an effort to approximate SPP's "Day 1" market design.

Q. Do these revised simulations result in reliable estimates of RTO production cost benefits for Aquila?

A. No, they do not. While the benefits that can be quantified from the revised simulations no longer suffer from the substantial Aries commitment-related distortions discussed in

my rebuttal testimony, they continue to show significant distortions as a result of the additional modeling issues and limitations that the revised simulations have brought to light.

Q. What are these additional modeling issues?

A. My review of CRA workpapers for the revised simulations identified at least two additional modeling issues or limitations that greatly distort the results in such a manner as to make them unsuitable to determine whether production cost savings to Aquila would likely be higher in the "Aquila in Midwest ISO" or the "Aquila in SPP" case. These two modeling issues are: (1) the simulation of planned generator outage schedules; and (2) the imposition of transmission charges on physical flows rather than contract paths. In addition, the revised simulations continue to erroneously allocate uplift charges in the Midwest ISO and SPP cases as I already explained on page 21 through 23 of my rebuttal testimony. The resulting impact of these issues and limitations is that estimated production cost savings for the "Aquila in Midwest ISO" case continue to be significantly understated relative to the "Aquila in SPP" case.

IV. MODEL LIMITATIONS THAT IMPACT OUTAGE SCHEDULES

Q. What modeling issue has first come to light as a result of the additional simulations?

A. A significant issue was the discovery of impacts that result from unrealistic simulation of planned generator outages.

Q. Please explain.

A. Simply put, the planned generator outage schedules are different in each of the three scenarios. As such, the current set of simulations are measuring the combined impact of

two major changes: (1) unit commitment and dispatch changes due to participation in an RTO versus stand-alone operations, and (2) unit commitment and dispatch changes due to different planned generator outage schedules.

Q. What is the impact on the latest set of simulations of different planned maintenance schedules in each scenario?

A. The planned generator outage schedules for Aquila result in significantly greater production costs to Aquila in the revised "Aquila in Midwest ISO" case as compared to the "Aquila in SPP" case. This is solely an artifact of how GE-MAPS has selected the planned outages of Aquila generating units in the Midwest ISO and SPP cases, which simply assigns planned outages on a pool-wide basis without taking into account any of Aquila's economic interests (e.g., in terms of reducing replacement power costs). The model logic resulted in outage schedules that are significantly more concentrated and more costly to Aquila in the Midwest ISO case than in the SPP case, which understates the estimated benefits for the "Aquila in Midwest ISO" case relative to the "Aquila in SPP" case.

Q. How did the GE-MAPS program select the Aquila outage schedules in the Midwest ISO case versus the SPP case?

A. GE-MAPS allows for user-specified maintenance schedules or "automatic" maintenance schedules that are scheduled by the program so as to levelize, to the extent possible, the available reserves on an area, utility, pool, or system-wide basis. CRA has confirmed that its simulations selected outage schedules on a pool-wide basis (i.e., all of the Midwest ISO and all of SPP). This, however, means that the model selected outages schedules in the Midwest ISO and SPP cases merely with the objective to levelize (over

the course of the year) the available reserves within the entire Midwest ISO and SPP footprint. The program does that by simply scheduling the "largest" units first and then proceeds in descending order.[3] While the outage scheduled selected by this algorithm may be reasonable on the pool-wide basis, this can result in maintenance schedules that are clearly suboptimal for individual utilities in terms of the timing and costs of the scheduled outages. It is also clear that this algorithm can lead, more or less by chance, to the different Aquila outage schedules we observed in the Midwest ISO and SPP cases simply because the Aquila units are in a different "rank order" depending on whether Aquila is in SPP or the Midwest ISO.

Q. Is this a reliable or realistic approach to model scheduled outages for the purpose of these simulations?

A. No, it is not. Small differences in outage schedules that have no impact on pool-wide or system-wide costs can have significant implications on the costs of individual utilities, such as Aquila in this case. Given that the RTO-related production cost savings we are trying to identify and quantify are approximately 1% to 3% of overall Aquila production costs, it is very important to avoid discrepancies in Aquila's outage schedules across the simulation runs unless there are compelling reasons for such discrepancies. To allow the simulation model to arbitrarily modify outage schedules across the cases with simplistic rules, such as levelizing available reserves on a pool-wide basis, will only serve to introduce substantial "noise" and non-comparability issues in regards to the measurement of RTO-related benefits. In the specific context of this case, this is not a reliable

[3] The GE-MAPS generation outage scheduling algorithm used in the CRA simulations rank orders generating units from largest to smallest for scheduling purposes based on the product of unit size and required outage duration (i.e., "size" is measured in MW-weeks).

approach to develop comparable measures of RTO-related benefits for different RTO scenarios. It is also not realistic because neither the Midwest ISO nor SPP develop or generally are able to adjust the outage schedules of its participating members, nor are the members' outage schedules determined with the objective to levelize reserves on an RTO-wide basis or without regard to outage-related costs.

V. MODEL LIMITATIONS THAT IMPACT RATE DEPANCAKING BENEFITS

Q. How does the second modeling issue you identified—the fact that transmission charges are imposed on physical flows rather than contract-path transactions—distort the results from the revised set of simulations?

A. The revised simulation results have magnified the concern I noted on page 7 (lines 8-11) of my rebuttal testimony, namely that the application of transmission charges to physical flows rather than to contract path schedules could serve to underestimate de-pancaking-related benefits for the "Aquila in Midwest ISO" case relative to the "Aquila in SPP" scenario. My review of CRA workpapers confirms this concern, which was further magnified by the revised simulations.

Q. How does the GE-MAPS model used for the Aquila Study apply transmission charges to transactions between different market areas?

A. As explained on page 32 of the Aquila Study, the GE-MAPS model used for this study applies "wheeling rates" to the net interregional power flows. More precisely, the GE-MAPS model used in these simulations is set up such that a wheeling charge (or any other specified transaction cost or "hurdle rate") is applied to the *physical flows* on each

individual tie-line between the defined pools (e.g., between the Midwest ISO and SPP as indicated in Table 13 on page 32 of the Aquila Report).

Q. Is this consistent with how wheeling rates are charged by transmission operators?

A. No. Transmission operators, such as RTOs or transmission owners in non-RTO markets, impose transmission charges on approved transmission schedules that are defined on a *contract path*, not a physical flow, basis. Under the contract path methodology, transactions between neighboring utilities only involve transmission charges for the two systems. The actual physical flows associated with that transaction, however, follow the path of least resistance, which means the actual physical flows will generally involve multiple utility systems. The problem is that the GE-MAPS model charges a wheeling rate for each utility system (i.e., each "pool" with a wheeling rate as defined in the model) that carries a physical flow in the simulation. This can result in higher charges for transmission service than would actually occur in the real world given the actual transmission tariffs.

Q. What impact does the model's imposition of transmission charges based on physical flows have on the identification and quantification of RTO benefits?

A. It will understate RTO benefits associated with reduced pancaking of transmission rates.

Q. Please explain.

A. If the wheeling charges between two neighboring transmission operators are eliminated, this will fully eliminate (i.e., de-pancake) the transmission charges faced by any transactions between these transmission operators. In other words, if Aquila joined the Midwest ISO, transmission charges between the Midwest ISO and Aquila would be

eliminated entirely. Correspondingly, if Aquila joined SPP, the charges for transactions between Aquila and SPP would also be eliminated entirely.

This does not happen in the model, however, because transmission charges are applied to physical flows. Because physical flows will almost always involve more than just the two neighboring transmission providers (e.g., the Midwest ISO and Aquila), the elimination of wheeling charges between the two transmission operators will not fully eliminate the transmission charges imposed in the GE-MAPS simulations. Rather, and despite the fact that there are no longer any contract path charges (e.g., for a transaction from the Midwest ISO to Aquila), the GE-MAPS simulations will continue to impose transmission charges on some of the physical flows associated with such transactions.[4]

Although the fact that power flows deviate from contract paths has always been a reality of transmission operations, this is not consistent with how transmission usage is charged. To impose charges on physical flows thus means that the economic benefit of de-pancaking is not fully realized in the simulations—particularly for transmission owners like Aquila that are at the boundary between two or more transmission operators, where a larger portion of power flows tends to involve neighboring systems.

Q. How does this affect de-pancaking-related benefits for the "Aquila in Midwest ISO" relative to the "Aquila in SPP" case?

A. It will underestimate the benefits of de-pancaking in the "Aquila in Midwest ISO" simulations relative to the "Aquila in SPP" case. This is because the number and volume of power flows to which such incorrectly pancaked transmission charges are applied by

[4] As an example, for an Ameren-to-Aquila transaction in the "Aquila in Midwest ISO" case the model would continue impose a Midwest ISO wheeling charge on the portion of flows that cross from Ameren into AECI as well as an additional AECI charge on the portion of flows that crosses from AECI into Aquila.

the model is greater for Midwest ISO-to-Aquila transactions in the "Aquila in Midwest ISO" case than for SPP-to-Aquila transactions in the "Aquila in SPP" case. As a result, the simulations will understate the production cost savings that Aquila would experience if it joined the Midwest ISO.

Q. Does this issue apply to all simulations of this nature or only to the simulations in the context of the Aquila Study?

A. To some degree this issue exists for most of these types of production cost simulations. However, in the instant case, the facts are such that this modeling issue distorts and biases the results. The impact of this flow-based pancaking issue is magnified in this particular case by the fact that Aquila is a relatively small utility with many "near-by" boundaries on which transmission charges apply even on a contract-path basis.

V. CONCLUSIONS

Q. What conclusions do you have based on the additional model simulation work performed since you filed rebuttal testimony?

A. The recently-received revised simulations further document that model limitations inappropriately bias estimated production cost benefits in favor of the "Aquila in SPP" case. The bias and estimation errors created by these modeling limitations are too large to conclude that the production cost savings of Aquila joining SPP would be any larger than the savings associated with Aquila joining the Midwest ISO. Based on the discussed new insights about the modeling limitations and my previously-presented correction to the production cost savings estimated in the Aquila Study, I conclude that the production cost benefits of Aquila joining either the Midwest ISO or SPP likely will likely be in the

1% to 3% range. The market modeling efforts undertaken simply are not sufficiently precise to conclude that joining either the Midwest ISO or SPP would offer significantly larger production cost savings. Under some modeling assumptions these savings are slightly larger in SPP, while under alternative assumptions the savings may be slightly larger in the Midwest ISO. Accordingly, it is important to recognize that, in addition to these production cost studies, it is equally important and essential that the broader RTO as benefits discussed in Mr. Richard Doying's rebuttal testimony be examined and considered when assessing overall RTO benefits.

Q. Does this conclude your supplemental rebuttal testimony?

A. Yes, it does.

Missouri Public Service Commission

Data Request

Data Request No.	0006
Company Name	Midwest Independent Transmission System Operator, Inc.-Investor(Electric)
Case/Tracking No.	EO-2008-0046
Date Requested	12/5/2007
Issue	General Information and Miscellaneous - Power Pool
Requested From	Mark Comley
Requested By	Greg Meyer
Brief Description	Questions concerning Mr Pfeifenberger's rebuttal testimony
Description	At page 10 of Mr. Pfeifenberger's rebuttal testimony he states: "only 'pool-internal' resources are considered in the generation-commitment stage of the simulations" run by CRA. Later at the bottom of page 10 and the top of page 11, he states: "a very significant portion of Aquila's resources – about 470 MW of jointly owned units and long-term purchases – are located outside Aquila's Missouri control area (see Aquila Study, p. 38). The simplified modeling of 'pool-based' unit commitment does not recognize the availability of these external resources in the Stand Alone and Midwest ISO cases." a. What does Mr. Pfeifenberger mean by "does not recognize the availability of the external resource in the Stand Alone and Midwest ISO cases"? Specifically, does he mean 1) These external resources were not available to provide energy to Aquila? 2) These external resources were available to provide energy to Aquila, but were not included in the unit commitment for Aquila? 3) These external resources were available to provide energy and unit commitment to Aquila, but were charged a unit commitment and/or dispatch hurdle rate? 4) If none of the above, please provide an explanation. b. Did Mr. Pfeifenberger confirm with CRA that it had excluded Aquila's "external" resources from being available for unit commitment? In this question, the phrase "not recognizing the availability of these external resources" is being treated as equivalent to "being excluded from being available for unit commitment." If this is not what Mr. Pfeifenberger meant, then substitute what was meant as the basis for this question and all its parts. 1) If so, with whom at CRA did Mr. Pfeifenberger confirm that Aquila's "external" resources were excluded from unit commitment to meet Aquila's load, and what was the exact description of this exclusion provided by that person? 2) If not, what is the basis for Mr. Pfeifenberger's claim?
Due Date	12/25/2007

The attached information provided to Missouri Public Service Commission Staff in response to the above data information request is accurate and complete, and contains no material misrepresentations or omissions, based upon present facts of which the undersigned has knowledge, information or belief. The undersigned agrees to immediately inform the Missouri Public Service Commission Staff if, during the pendency of Case No. EO-2008-0046 before the Commission, any matters are discovered which would materially affect the accuracy or completeness of the attached information.

If these data are voluminous, please (1) identify the relevant documents and their location (2) make arrangements with requestor to have documents available for inspection in the Midwest Independent Transmission System Operator, Inc.-Investor(Electric) office, or other location mutually agreeable. Where identification of a document is requested, briefly describe the document (e.g. book, letter, memorandum, report) and state the following information as applicable for the particular document: name, title number, author, date of publication and publisher, addresses, date written, and the name and address of the person(s) having possession of the document. As used in this data request the term "document(s)" includes publication of any format, workpapers, letters, memoranda, notes, reports,analyses, computer analyses, test results, studies or data, recordings, transcriptions and printed, typed or written materials of every kind in your possession, custody or control or within your knowledge. The pronoun "you" or "your" refers to Midwest Independent Transmission System Operator, Inc.-Investor(Electric) and its employees, contractors, agents or others employed by or acting in its behalf.

Security Public
Rationale NA

With Proprietary and Highly Confidential Data Requests a Protective Order must be on file.

Mr. Pfeifenberger provided the response to this data request. MWC

Amended Response:

(This amended response only corrects the stated date in the subtitles of Figures 1 and 2)

a) The phrase “does not recognize the availability of the external resources in the Stand Alone and Midwest ISO cases” meant that, despite the fact that external resources are available to Aquila (and are utilized as imports during the generation dispatch stage of the simulations), the GE-MAPS model does not generally include (i.e., make available) external resources in determining unit commitment to serve load and meet reserve requirements within the Aquila “pool”.

The GE-MAPS model has two modes that can be used to determine unit commitment for the purpose of market simulations: (1) “pool commitment”; and (2) “system commitment.” The “system commitment” algorithm of GE MAPS optimizes unit commitment on a system-wide basis subject to commitment hurdle rates. In contrast, under the “pool commitment” algorithm, which tends to oversimplify the simulations but reduces computer run time, the model generally commits only pool-internal resources to supply the pool-internal load and reserve requirement.

This "pool commitment" algorithm generally does not "look" to use resources external to a defined pool during the unit commitment stage of simulations unless such external resources are necessary from a reliability perspective.

In my rebuttal testimony, I attributed the excessive uneconomic dispatch of the Aries merchant plant in the Stand Alone and Midwest ISO cases to a shortcoming of the "pool commitment" algorithm of GE-MAPS with respect to imports from Aquila's jointly-owned external generating resources. After my rebuttal testimony was filed, CRA investigated this matter further and clarified GE-MAPS' treatment of jointly-owned external generating units in the model's "pool commitment" algorithm. Based on this additional research and through further confirmation with GE personnel, CRA clarified that GE MAPS does recognize (i.e., make available) jointly-owned external generating units under "pool commitment." Under "pool commitment," if either pool in which a jointly-owned unit is located needs the unit for commitment purposes, it will be committed and available for both pools to use. However, CRA also confirmed that commitment and dispatch hurdle rates still apply for a jointly-owned unit that is located outside the defined pool.

This additional information means that Aquila's jointly-owned external units were in fact considered (i.e., available for commitment by the model) under the "pool commitment" algorithm of GE-MAPS. However, the "pool commitment" algorithm does not consider the availability of imports into the Aquila control area from third-party resources (e.g., market-based imports that could be arranged on a day-ahead basis).

Based on additional analysis undertaken since my rebuttal testimony was filed (as discussed further below), this shortcoming of the "pool commitment" mode of GE MAPS to consider third-party (or market-based) imports—i.e., not the failure to consider imports from Aquila's jointly-owned external resources as suggested in my rebuttal testimony—appears to be source of the model's excessive uneconomic commitment of the Aries merchant plant in CRA's Stand Alone and Midwest ISO simulations. Accordingly, I will need to update and/or supplement my rebuttal testimony to clarify this issue.

b) I had confirmed in discussions with Alex Rudkevich, Ralph Luciani, and Minghai Lui of CRA that (i) CRA had used the "pool commitment" (rather than "system commitment") mode of GE-MAPS, and (ii) my understanding is that this GE-MAPS commitment mode determines unit commit by considering only pool-internal resources (unless reliance on external resources is required for reliability purposes). This means under the "pool commitment" mode, external resources generally are not made available for unit commitment in the model simulations. This understanding was consistent with The Brattle Group's own extensive experience with GE-MAPS.

In the context of substantial uneconomic commitment of the Aries merchant plant in the Stand Alone and Midwest ISO cases, my discussions with CRA personnel also addressed the issue of whether the "pool commitment" mode also excluded imports from Aquila's own jointly-owned external units. However, while they confirmed that imports from third party (i.e., market-based) resources are not available for unit commitment under the "pool commitment" mode of GE-MAPS, I misunderstood our previous discussions with respect to imports from Aquila's jointly-

owned external units. Since my rebuttal testimony was filed, CRA clarified that the "pool commitment" algorithm of GE-MAPS does make available for unit commitment capacity from Aquila's jointly-owned external resources. However, as noted in my response to (a), those imports from jointly-owned external resources are still charged a unit commitment and dispatch hurdle rate.

The following example illustrates this shortcoming of the "pool commitment" algorithm for a one-week period in February 2008 by comparing CRA's original Stand Alone simulations in this period with the same period in the additional "No Aries" Stand Alone simulation.

Figure 1 compares Aries' average production costs in February 2008 with the locational marginal prices (LMP) at the Aries merchant plant. It shows that during this entire week, Aries' average production cost significantly exceeds the LMP at the plant's location in the original 2008 run (i.e., the "with Aries" run); it also shows that the average production cost exceeds the LMP at the plant's location in the "No Aries" run in all but three hours. Dispatch of the Aries plant during this week would consequently result in costs that are in excess of market-based purchases. (The fact that the LMP at the location of the Aries plant is below the plant's average production cost also strongly suggests that a dispatch of the Aries plant will not be related to transmission constraints. Otherwise, the LMP at the Aries plant would equal or exceed the plant's dispatch costs.)

Figure 1
Aries Average Production Costs and LMPs, Stand Alone Case
February 12 - February 18, 2008

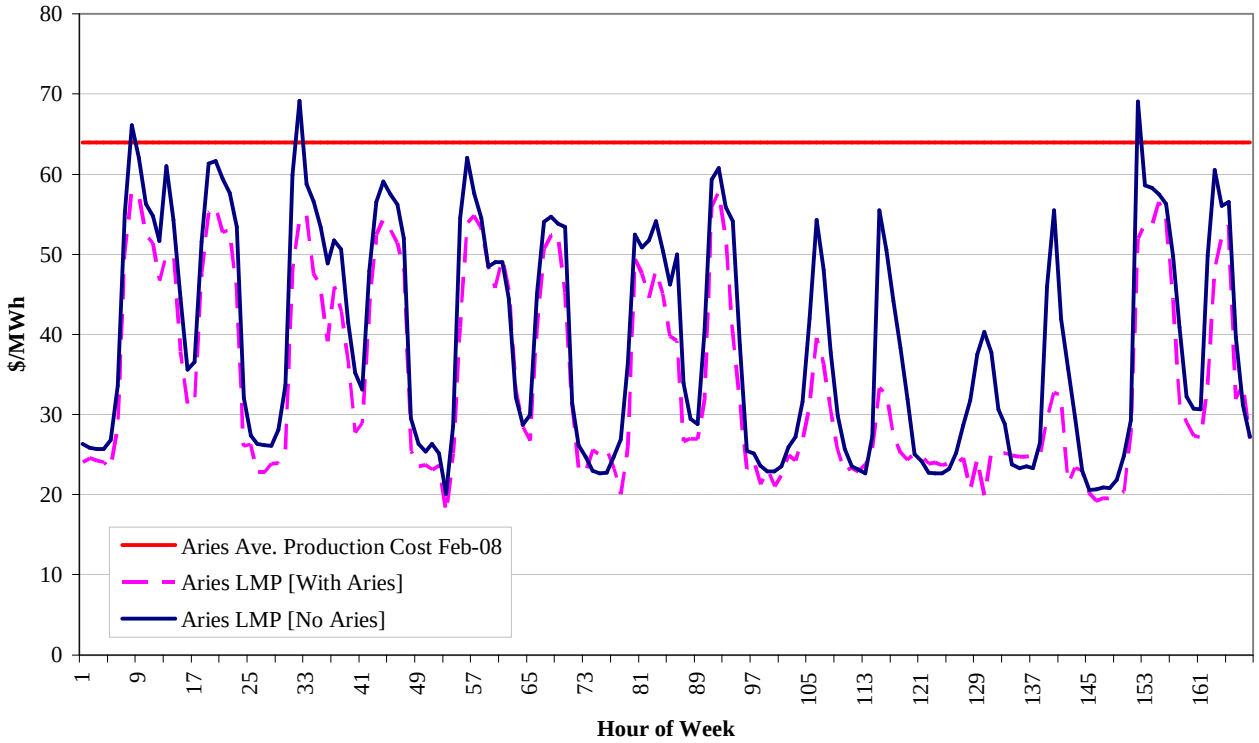
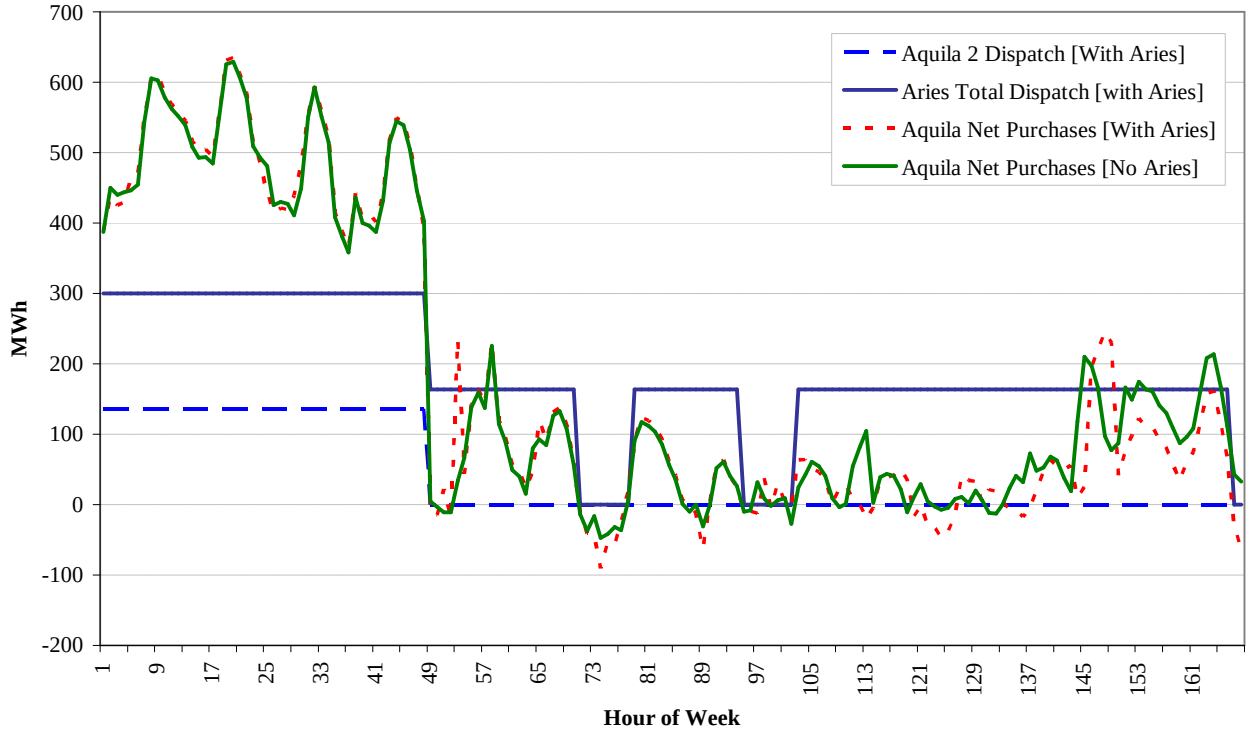


Figure 2 compares the Aquila purchases and market-based net imports (i.e., total imports net of imports from jointly-owned external resources) of the model results for the Aries dispatch in the original 2008 Stand Alone case and the 2008 "No Aries" Stand Alone case. The green line shows that without Aries (i.e., in the "No Aries" case), Aquila would purchase and import into its control area between 0 MW and 600 MW to serve its load in this time period. The dashed red line shows that in the original case that includes Aries, Aquila's purchases (i.e., purchases from Aries and market-based net imports) are very similar to the net imports in the "No Aries" case.

Figure 2
Aries Generation and Aquila Net Purchases, Stand Alone Case
February 12 - February 18, 2008



However, despite the fact that market prices are significantly below Aries production costs, the blue lines in Figure 2 show that Aries is routinely committed and dispatched by the model. The chart indicates that: (1) one or both of the modeled Aries units (CRA modeled the Aries plant as two units, labeled "Aquila" and "Aquila 2") are committed whenever Aquila is a net purchaser of power; (2) the Aries plant is not committed when Aquila is a net seller of power; and (3) the two Aries units are dispatched at only 164 MW and 136 MW, which is the *minimum* generation level that CRA defined for each of the two units. The fact that the Aries units are dispatched only at their minimum load documents that the Aries commitment and dispatch is uneconomic relative to market imports, which imposes uplift costs (i.e., the difference between Aries production costs and market prices) that the CRA calculations have determined and then allocated fully to Aquila.

The fact that Aries was committed whenever Aquila needed to purchase power indicates that the availability of lower-cost imports is not accounted for during the commitment stage under the "pool commitment" algorithm of the GE-MAPS model. Rather than making such imports

available and part of the commitment decision during the commitment stage of the simulations, the model relies on the commitment of the Aries plant to support serving load regardless of the uneconomic outcome of doing so. However, during the dispatch phase of the model then partially recognizes that the commitment choice is uneconomic, and the model then dispatches the Aries plant at its minimum level. If Aquila's net purchases exceed the minimum Aries dispatch, these purchases are imported during the dispatch stage of the simulations rather than supplied through Aries. If the minimum Aries dispatch exceeds Aquila's net purchases, the difference is exported and sold at a loss.

In the "No Aries" simulation run, Aries is not available for commitment by the model. So instead of committing Aries, it appears that the model relies on Aquila's higher-cost combustion turbines to serve load during the commitment stage. CRA explained that combustion turbines are modeled in GE-MAPS as must-run units with a minimum dispatch level of zero. This means that the model can "switch off" (i.e., dispatch at zero MW) the combustion turbines during the dispatch stage of the simulations and, instead of using high-cost CTs, satisfy Aquila's net purchase requirement through lower-cost imports. Given that the price of market-based imports is significantly below the Aries production costs during most of the Fall, Winter and Spring months, this dispatch result (i.e., not relying on Aries) clearly is more economical and realistic. It would not make sense for the owner of Aries, for Aquila, or anybody else to commit Aries unless there is a meaningful prospect that market prices exceed production costs.