2010 Wholesale Power Rate Case Initial Proposal

REBUTTAL TESTIMONY

REBUTTAL FOR GENERATION RESERVE FORECAST

April 2009

WP-10-E-BPA-42

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INDEX

REBUTTAL TESTIMONY of

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Witnesses for Bonneville Power Administration

SUBJECT: REBUTTAL FOR GENERATION RESERVE FORECAST Page

Section 1: Introduction and Purpose of Testimony 1

Section 2: Estimate of Installed Wind Capacity During the Rate Period 2

Section 3: Scaling Methodology.....5

Section 4: Wind Scheduling Accuracy 12

Section 5: Allocation of the Total Reserve Requirement Between Load and Wind 17

Section 6: Proposed Changes to the Methodology 22

Rebuttal for Generation Reserve Forecast Exhibits **Page**

Exhibit 1: Response to BPA-IR-01 31

Exhibit 2: Response to BPA-NG-01 32

Exhibit 3: Correlation Matrix - Based on Actual MW Generation by Hour 34

Exhibit 4: Correlation Matrix - Based on 5-Minute MW Generation Changes 35

Exhibit 5: Correlation Matrix - Based on 30-Minute MW Generation Changes 36

Exhibit 6: Correlation Matrix - Based on 60-Minute MW Generation Changes 37

Exhibit 7: MAE and RMSE from 2-hour average persistence 38

Exhibit 8: MAE and RMSE from 1-hour average persistence 39

Exhibit 9: MAE and RMSE from 60-minute instantaneous persistence 40

Exhibit 10: MAE and RMSE from 45-minute instantaneous persistence 41

Exhibit 11: MAE and RMSE from 30-minute average persistence 42

Exhibit 12: Wind Imbalance and Load Imbalance vs. Total Imbalance 43

Exhibit 13: Total Reserve - Old Total Reserve/Old Load Input 44

Exhibit 14: Total Reserve - Old Total Reserve/New Load Input 45

Exhibit 15: Total Reserve – New Total Reserve/Old Load Input 46

Exhibit 16: Total Reserve – New Total Reserve/New Load Input 47

Exhibit 17: Wind Reserve - Old Total Reserve/Old Load Input 48

Exhibit 18: Wind Reserve - Old Total Reserve/New Load Input 49

Exhibit 19: Wind Reserve - New Total Reserve/Old Load Input 50

Exhibit 20: Wind Reserve – New Total Reserve/New Load Input 51

Exhibit 21: Load Reserve - Old Total Reserve/Old Load Input 52

Exhibit 22: Load Reserve – Old Total Reserve/New Load Input 53

Exhibit 23: Load Reserve - New Total Reserve/Old Load Input 54

Exhibit 24: Load Reserve - New Total Reserve/New Load Input 55

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SUBJECT: REBUTTAL FOR GENERATION RESERVE FORECAST

Section 1: Introduction and Purpose of Testimony

Q. Please state your names and qualifications.

A. My name is Bartholomew A. McManus, and my qualifications are contained in WP-10-Q-BPA-45.

A. My name is Steven B. Barton, and my qualifications are contained in WP-10-Q-BPA-03.

A. My name is Juergen M. Bermejo, and my qualifications are contained in WP-10-Q-BPA-05.

A. My name is Stephen H. Enyeart, and my qualifications are contained in WP-10-Q-BPA-16.

A. My name is Ronald E. Messinger, and my qualifications are contained in WP-10-Q-BPA-46.

Q. Have you previously submitted testimony in this proceeding?

A. Yes. We submitted testimony sponsoring the Generation Reserve Forecast in the Generation Inputs Study (Study), WP-10-E-BPA-08, Section 2. McManus *et al.*, WP-10-E-BPA-23.

Q. What is the purpose of your rebuttal testimony?

A. The purpose of our rebuttal testimony is to respond to the direct testimony of certain parties regarding the Generation Reserve Forecast. Specifically, Section 2 of our rebuttal testimony includes our response to testimony regarding the estimate of the installed wind capacity in the BPA Balancing Authority Area (BAA) during the rate period. Section 3

addresses the testimony regarding the scaling methodology. Section 4 addresses wind scheduling accuracy. Section 5 addresses the comments on the allocation of the total reserve requirement between wind and load. Section 6 describes the new load forecast assumptions and a proposed change to the total reserve calculation in the forecast methodology.

Section 2: Estimate of Installed Wind Capacity During the Rate Period

Q. Have you reviewed the testimony regarding the estimate of the installed wind capacity in the BAA during the rate period?

A. Yes. Iberdrola and Northwest Wind Group (NWG) submitted testimony regarding our estimate. Froese *et al.*, WP-10-E-IR-01, at 25; Dragoon, WP-10-E-NG-01, at 17.

Q. Iberdrola and NWG commented generally that you overestimated the amount of installed wind capacity that will be online during the rate period because the estimate does not reflect current conditions. Will you update the estimate of the installed wind capacity during the rate period for the Final Proposal in this proceeding?

A. Yes. Exhibits 13 to 24 include forecasts of the reserve requirement using various assumptions described in Section 6 of this rebuttal testimony. These forecasts were based on our most recent estimate of the installed wind capacity that will be online during the rate period. The current estimate of the installed wind capacity during the rate period by month is included on the left side of Exhibits 13 to 24. The current estimate of the average installed capacity for the rate period is 3053 MW, which is 686 MW less than the 3739 MW average estimated in the Initial Proposal. In addition to considering the latest information from the project developers and the criteria listed in the direct testimony, such as study progress, permitting progress, and time to construct the interconnection facilities, the updated estimate was developed considering when the wind projects would

achieve commercial operation. This resulted in shifts of some of the wind projects' online commercial operation date to later months of the rate period or delays beyond this rate period.

Q. Iberdrola and NWG suggest that BPA adjust its estimate to reflect the announcement that Puget Sound Energy will remove its wind facilities from the BPA Balancing Authority. Froese et al., WP-10-E-IR-01, at 25; Dragoon, WP-10-E-NG-01, at 17. Iberdrola testified specifically that it has plans to delay up to 500 MW of interconnection requests that are currently in the BPA interconnection queue. Froese et al., WP-10-E-IR-01, at 25. Have you taken into account the information that you have been provided regarding the plans for specific wind facilities?

A. Yes. The Puget Sound Energy facilities will not be included in the updated estimate used for the Final Proposal. Iberdrola's plans for delay have been accounted for as well. We submitted data requests to Iberdrola and NWG regarding any plans for delay in the development of wind facilities expected to be online during the rate period. The responses are attached as Exhibits 1 and 2 to our rebuttal testimony.

Q. Does taking this information into account necessarily lead to a megawatt-for-megawatt reduction in the overall estimate of installed wind capacity from the estimate in the Initial Proposal?

A. No. BPA's interconnection queue currently includes pending requests to interconnect 90 wind projects representing approximately 14,000 MW. McManus *et al.*, WP-10-E-BPA-23, at 7. Most of these requests seek to interconnect by 2013, and generators may submit new requests at any time. Given these dynamics, even if certain projects leave the BAA or delay development, requests for new projects may enter the queue, and projects with existing requests may accelerate their development schedule.

Changes to the estimate are a product of many factors rather than isolated decisions with respect to specific facilities.

Q. Iberdrola and NWG also suggest that you adjust the estimate to account for current economic conditions. Froese et al., WP-10-E-IR-01, at 25; Dragoon, WP-10-E-NG-01, at 17. Did the estimate in the Initial Proposal reflect the impact of current economic conditions on developers' decisions with respect to their wind projects?

A. Yes. The estimate used in the Initial Proposal was developed in July 2008, and it was based, in part, on direct communications with developers about the status of projects with requests in the BPA interconnection queue. As we described in direct testimony, information received directly from project developers in the interconnection process is one of the primary pieces of information considered in developing the estimate. McManus *et al.*, WP-10-E-BPA-23, at 8. The information that developers are conveying to BPA should provide the most direct indication of the impact of economic conditions on their projects and decisionmaking, and that information is reflected in our estimates of the projects that will be online during the rate period.

Q. Did you make any specific, quantitative adjustment to the estimate used for the Initial Proposal to take into account economic conditions at that time?

A. No. As described above, any impact of economic conditions is reflected through the information provided to us by developers.

Iberdrola and NWG suggest that the estimate should be reduced because of current economic conditions, but they did not suggest how to develop such an adjustment or quantify how current economic conditions have affected the plans of wind developers with projects scheduled to come online in the BAA during the rate period. The difficulty with making such an adjustment would be developing and quantifying an informed adjustment that is supported by a rational basis. BPA will continue to rely on the criteria

we have been using, which include the reactions of the developers to changes in economic conditions.

Section 3: Scaling Methodology

Q. Have you read the testimony of the rate case parties regarding the scaling methodology that you used to develop the Generation Reserve Forecast?

A. Yes. Iberdrola and NWG commented on the scaling methodology. Froese *et al.*, WP-10-E-IR-01, at 21-24; Dragoon, WP-10-E-NG-01, at 5-12.

Q. Iberdrola and NWG both maintain that the scaling methodology results in an overestimate of the reserves required to operate the system reliably and recommend that BPA use a different methodology or adjust the total reserve requirement to reflect error in the methodology. Froese et al., WP-10-E-IR-01, at 24; Dragoon, WP-10-E-NG-01, at 11. Do you agree with Iberdrola's and NWG's criticisms of the scaling methodology?

A. No. We disagree with their assertions that the methodology contains systematic errors and results in an overestimate of the overall reserve requirement. It is important to note that, despite Iberdrola's and NWG's claims that the scaling methodology results in an overestimate of the total reserve requirement, neither party presented any evidence or analysis to demonstrate that using different weather data, correlation assumptions, or methodologies would result in a reduction to the overall reserve requirement.

Q. What is your response to Iberdrola's specific criticisms that the 3TIER data "is not sufficiently robust to build the scaling the methodology around" and that BPA "averaged" the lead and lag data and adjusted that data to match the observations of BPA personnel? Froese et al., WP-10-E-IR-01, at 22.

A. Without having a real-time monitoring system for all wind in the area in which new wind facilities are to be built, the 3TIER data set is as good a data set as is available. 3TIER

has multiple years of data, and that data was used to find the most prevalent leads and lags for planned wind generation with respect to existing wind generation. We did not "average" the 3TIER data; rather, we used it as a starting point for our analysis. Where possible, we used the generation and lead or lag for more than one existing wind site to estimate the generation for future wind sites.

Q. Iberdrola points out that you "adjusted" the 3TIER data to match your observations regarding simultaneous wind ramps and states that observations at their facilities indicate that simultaneous ramps do occur. Froese et al., WP-10-E-IR-01, at 22. What is your response?

A. Iberdrola's claim seems to imply that BPA should not have adjusted the 3TIER data where there were zero values that indicate simultaneous ramps. As noted in our direct testimony, our observations have been that there are not a lot of wind ramping events in the BAA that occur precisely simultaneously. McManus, *et al.*, WP-10-E-BPA-23, at 13; Study, WP-10-E-BPA-08, at 12. In addition, the data in Exhibits 3-6 shows that there is very high correlation in the output of the wind facilities on an hourly average basis. Exhibits 3-6 include correlation analysis of actual wind generation data for the wind facilities operating in the BAA during March 2009. The correlation coefficient is a measure of the extent to which two data quantities tend to vary in similar or different ways. A high positive correlation (~+0.5 and higher) means that the two quantities tend to vary in the same direction. A high negative correlation (~-0.5 and lower) means that the two quantities tend to vary in opposite directions.

These exhibits show that for the megawatt output by hour, there is high correlation between all the wind facilities. There is limited correlation on the five-minute ramping, but there are some facilities with positive correlation with other facilities in the

five-minute ramping timeframe. As the analysis goes to 30-minute ramping and 60-minute ramping, there are more positive correlations between different facilities.

This correlation can also be seen by the low numbers found for regulation and following, with perfect schedules and the high numbers found for following with actual schedules, because the regulation and load following calculations are based on sub-hourly changes in wind output, keying on the 10-minute timeframe. See Study, WP-10-E-BPA-08, Tables 2.7-2.9. The following with actual schedules, on the other hand, is based more on the hourly component, because that component uses the hourly scheduled value to compare with the 10-minute averages rather than the hourly averaged value. The scheduled value is calculated based on the persistence calculation, so when the following with actual schedules is much higher than the regulation and following with perfect schedules, it shows that the wind fleet in the BPA BAA does have correlation in movements over longer periods of time.

Iberdrola's complaint about the adjustment of the zero values in the 3TIER data seems contrary to Iberdrola's overall claim that our scaling methodology results in an overestimated reserve requirement because there is no systematic pattern or correlation of wind ramps in the BAA. Froese *et al.*, WP-10-E-IR-01, at 22. If we had not adjusted the zero values in the 3TIER data, then the ramps between facilities would have shown much higher correlation. Furthermore, if we were to change the methodology to use the zero lead/lag as shown in the 3TIER dataset, the reserve requirement likely would increase.

Q. Iberdrola claims that there is no clear pattern of lag and lead times between facilities and that systemwide ramp rate and magnitude will be determined by a considerably more complex set of conditions than those laid out by BPA. Froese et al., WP-10-E-IR-01, at 22. NWG claims that the methodology "contains systematic errors that overestimate the

extent to which new projects are correlated with one another and the existing projects?" Dragoon, WP-10-E-NG-01, at 6. What is your response?

A. As we stated above, the March 2009 generation data shows that there is very high correlation in the output of the wind facilities over a 60-minute period. Nevertheless, even if a much more complex set of equations would better represent the future wind facilities' output, no party in this case appears to have developed these equations, and the equations do not exist at this point in time. We have not seen any data to demonstrate that another method would lower the correlation between future wind projects and existing wind projects while still maintaining the accuracy we have seen with our method. We also have not seen any data that would show that changing the scaling methodology would lower the reserve requirement. Such a change could just as easily raise the reserve requirement if modified from the current method.

Q. Attachment B to Iberdrola's testimony includes analysis of ramp times at Iberdrola facilities in the BPA BAA. Iberdrola claims that these results clearly show that ramp lead and lag times are not well-correlated between sites in the BAA. Froese et al., WP-10-E-IR-01, at 23. How do you respond to Iberdrola's analysis?

A. Iberdrola was able to find 22 ramping events for their wind fleet within a one-year period. These events and this analysis tend to show that the wind fleet inside BPA's BAA does not exhibit a lot of diversity when ramping events are studied. The wind fleet that Iberdrola used is spread across BPA's BAA, with the majority being located close to where the planned wind facilities are to be constructed. Therefore, the results show that the diversity of future wind facilities will probably not be as great during ramping events as Iberdrola and Northwest Wind Group estimate. From our perspective, Iberdrola's data suggests that our scaling methodology probably does not increase the amount of reserve calculated versus how much will be used when the wind is installed.

Iberdrola argued specifically that Big Horn was consistently ramping earlier than Klondike even though it is further east. Froese *et al.*, WP-10-E-IR-01, at 24. Big Horn also is north of the Columbia River, while Klondike is located south of the river. We do not disagree that there is more limited correlation between the two areas of those facilities insofar as short-term movement of generation is concerned. We correlated a few future wind facilities south of the Columbia River with wind facilities installed north of the Columbia River or vice versa, and there are only a couple of planned facilities in our studies for which we used installed wind facilities on both sides of the river when calculating the lead or lag for the scaling. These facilities are planned close to the Columbia River and, therefore, will see wind patterns based on a combination of the patterns seen at Big Horn and Klondike. Nevertheless, the more limited correlation between Big Horn and Klondike that Iberdrola attempts to demonstrate provides no basis to broadly conclude that our proposed scaling methodology is inherently flawed.

Q. NWG claims that BPA provided information in pre-rate case workshops that reflects some error in the scaling methodology that results in overestimating the reserve requirement. Dragoon, WP-10-E-NG-01, at 8. What did this information show?

A. NWG testified about only part of the analysis that BPA performed, and it did not point out the specifics regarding the facilities that BPA studied. In order to perform the analysis referenced by NWG, we downloaded the actual output of certain existing facilities and compared that output to what our scaling methodology would have predicted as the output of the facilities. The first analysis consisted of comparing the actual output of four facilities against what the scaling methodology predicted they would have generated in May and June of 2008 (WIT Technical Conference Call, September 17, 2008). The results of this analysis showed that, when compared visually, the ramps and peaks lined up, the standard deviations of the actual and estimated output were very

close, and the correlation between the actual and estimated output was very high. These results showed that the scaling methodology did not have any inherent flaws.

Our next analysis consisted of taking the same data from the same four wind facilities and calculating reserve requirements, first with the actual output of the facilities, and then doing the same calculation using the estimated output of the wind facilities (Rate Case Technical Meeting, November 12, 2008). The results of this analysis showed that the estimated values produced a higher *dec* value than the results when the actual output was used in the calculations. The issue with using the second analysis alone without taking into account the earlier analysis, however, is that the actual output of the four wind facilities did not reach the installed capacity used when estimating the output of the facilities. The four facilities in the study had gone into commercial operation fairly recently at the time of the analysis. Under these circumstances, the actual generation output during startup did not yet reflect the facilities' entire installed capacity. With this as an input to the study, it follows that the dec requirement would be greater for the estimated data versus the actual data, because the peaks of the actual data did not reach the full capacity of the wind facilities. We have seen that this is not the normal operation of wind facilities; it occurs during the startup. The high correlation and close standard deviations in the first analysis show that the estimated output is a good overall approximation of the actual output.

Q. What is your response to Iberdrola's and NWG's claims that the scaling methodology may capture the behavior of the wind on average, but the more relevant question is what happens during "extreme" events? Froese et al., WP-10-E-IR-01, at 23-24; Dragoon, WP-10-E-NG-01, at 8.

A. We agree that the reserve forecast should be based on the requirements to maintain reliable operations in extreme conditions, and we believe that capturing the behavior of

the wind on average leads to capturing an accurate depiction of the behavior during extreme events.

Q. NWG points out certain alternative approaches to the scaling methodology, such as using National Renewable Energy Laboratory data or introducing stochastic terms to reproduce expected correlations. Dragoon, WP-10-E-NG-01, at 10-11. Given the parties' testimony that BPA staff's methodology overestimates the total reserves need to operate reliably, what is your response to these suggestions?

A. The testimony seems to suggest that using different data or methods would result in a lower overall reserve requirement, but no party has presented any evidence or analysis that these alternatives would lead to such a result. Without any basis to evaluate whether different data or methods would improve on the forecast produced using our methodology, we have no reason to assume that using different data or methodology would lower the total reserve requirement. It is equally likely that the reserve amounts would increase or decrease if the scaling methodology is modified.

Q. NWG maintains that the alleged failure of the scaling methodology to fully account for the diversity on the system results in increasing the error in the scheduling accuracy assumptions in the forecast. Dragoon, WP-10-E-NG-01, at 10-11. What is your response?

A. We do not agree with NWG's criticisms of the scaling methodology, and our rebuttal testimony demonstrates that there is no inherent flaw or error in the methodology. Therefore, we believe that there has been no increase in the error in the scheduling accuracy assumptions in the forecast. As additional wind facilities come online and we obtain more wind-related data, we will assess whether we can improve the methodology for use in the future.

Q. Are you adjusting the overall forecast of the reserve requirement to reflect the "error" alleged by Iberdrola and NWG?

A. No. We do not agree that the scaling methodology includes systematic errors that overstate the balancing reserve required to operate the system reliably. The parties provided no evidence to demonstrate that such an error exists and no analysis to quantify any alleged error. Northwest Wind Group's description of the analysis of the scaling methodology that we conducted before the rate case began was incomplete and incorrect for the reasons we described previously. That analysis showed that the results of the scaling methodology for those four facilities were fairly accurate. We are satisfied that the scaling methodology is sound, and the claims of the rate case parties have not changed our position.

Section 4: Wind Scheduling Accuracy

Q. Have you read the parties' testimony regarding the Initial Proposal assumptions about the accuracy of wind schedules during the rate period?

A. Yes. Iberdrola, NWG, and Public Power Council (PPC) *et al.*, submitted testimony regarding our assumption in the Initial Proposal that the scheduling accuracy during the rate period would be equivalent to scheduling accuracy under a two-hour persistence model. Froese *et al.*, WP-10-E-IR-01, at 26-34; Dragoon, WP-10-E-NG-01, at 13-16; Baker *et al.*, WP-10-E-JP6-01, at 10-13.

Q. NWG testifies that the current scheduling accuracy reflects a 30-minute persistence model. Dragoon, WP-10-E-NG-01, at 13-16. Iberdrola comments that it expects scheduling accuracy of the wind fleet to improve in the future and provides evidence that it currently schedules with an accuracy that resembles the 30-minute persistence. Froese et al., WP-10-E-IR-01, at 26-34. What is your response?

A. We have noticed a distinct and across-the-board improvement in the overall mean absolute error (MAE) for schedules from August 2008 through February 2009 when compared to the MAE for scheduling and generation data from the August 2007 to August 2008 time period used to establish the scheduling accuracy assumption in the Initial Proposal. McManus *et al.*, WP-10-E-BPA-23, at 15. The MAE is a standard metric used to describe the accuracy of a forecast and reflects the average of the absolute value of the error over the sample size. The improvement in scheduling accuracy appears to be attributable to the awareness campaign that the BPA Wind Integration Team (WIT) initiated after publishing data to illustrate the accuracy of the schedules BPA was receiving. The noticeable improvement in scheduling accuracy appears to have begun in September 2008 and has been sustained.

We recently completed analysis of seven months of scheduling and actual generation data from August 3, 2008, to March 3, 2009. We applied the same methods that we used for the scheduling accuracy assumptions in the Initial Proposal. McManus *et al.*, WP-10-E-BPA-23, at 15-18. Our more recent analysis includes data for four new projects in the BPA BAA. Recall that we examined scheduling and actual generation data from 14 wind facilities in the BAA for the Initial Proposal. *Id*. at 15. The schedules continued to generally lag the observed generation, so we continued to focus on simple persistence models to simulate scheduling behavior. We re-ran the correlation and error statistics assuming the following persistence levels: 2-hour average, 1-hour average,

60-minute instantaneous, 45-minute instantaneous, and 30-minute instantaneous. The terms "average" and "instantaneous" are used here for clarity and represent the value used for the forecasting hour. For example, the 1-hour average assumes the forecast for a given hour is equal to the average actual generation for the hour prior to that hour being forecast. The 60-minute instantaneous assumes the forecast for a given hour is equal to the instantaneous actual generation 60 minutes prior to that hour being forecast. The results of our analysis are included in Exhibits 7-11 to this rebuttal testimony.

The MAE was best represented by the 2-hour average and the 60-minute instantaneous levels (11 and 8 out of 18, respectively), with the 45-minute instantaneous being the next best (5 of 18). *See* Exhibits 7, 9, and 10. The 1-hour average and 30-minute instantaneous MAE were not representative of the error statistics observed during this time period (acceptable for only 2 of 18, each). *See* Exhibits 8 and 11.

The root mean squared error (RMSE) was best represented by the 2-hour average and the 60-minute instantaneous levels (7 out of 18, each), with the 45-minute instantaneous being the next best (3 of 18). *See* Exhibits 7, 9, and 10. The 1-hour average and 30-minute instantaneous RMSE were not representative of the error statistics observed during this time period (acceptable for only 1 and 2 out of 18, respectively). *See* Exhibits 8 and 11.

While the error statistics were replicated well by the 2-hour average level, the correlation analysis does not support a conclusion that this is reflective of the overall scheduling patterns during this time period. The correlation coefficient is a measure of the linear relationship between two variables. A greater value indicates a stronger linear relationship. In the context of wind schedules and actual generation as variables, it represents the lagging behavior of the schedules for a given project. For those projects that had a peak correlation coefficient at the 2-hour average level, the next greatest

correlation coefficient was the 60-minute instantaneous level (4 projects). The correlation analysis suggests the actual current scheduling patterns are best represented by the 60-minute instantaneous assumption. This is based on the good representation of the accuracy statistics and high degree of correlation to actual scheduling behavior since we began to observe noticeable improvement last fall.

Q. Iberdrola provides analysis of data from February 23 to March 16 indicating that Iberdrola has met or improved upon a 30-minute persistence forecast at its Big Horn facility and that its accuracy for other facilities is very close to 30-minute persistence. Froese et al., WP-10-E-IR-01 at 30-32. What is your response to this analysis?

A. Iberdrola provided the data used to develop their Attachment C in discovery. We reviewed the data for this three-week period and acknowledge that, for the projects for which Iberdrola provided data, the schedules submitted very closely resemble, or slightly beat, 45-minute persistence for this period. Nevertheless, there is natural variability in the accuracy that any one facility may attain in a short period of time. For example, analysis of a 3-week period may suggest that accuracy statistics for a given facility are more closely indicative of 45-minute levels, while the same analysis on the next 3-week period may suggest it more closely resembles accuracy of 60-minute persistence levels. In fact, a cursory analysis of data for the three-week period (March 16 to April 6) immediately following the period that Iberdrola used suggests that accuracy statistics for one of the facilities in Iberdrola's analysis are more closely indicative of 60-minute levels. Under these circumstances, the period of demonstration is too short to determine whether this is sustainable accuracy and behavior. It is not known whether the Wind Asset Management Meteorology (WAMM) process described by Iberdrola was in effect in the late March/early April period. *See* Froese *et al.*, WP-10-E-IR-01, at 32.

The data provided by Iberdrola in discovery suggests that their WAMM process should improve over current scheduling practices. The data shows that actual schedules differed from the WAMM team forecasts up to 58 percent of the time when a WAMM forecast was available. Iberdrola's testimony does not offer any assurance that the improved forecasting process will be implemented into their scheduling process in the exact manner described. Finally, Iberdrola's performance is not necessarily representative of the entire wind fleet, and our rate proposal must include a forecast of the reserve need of the entire BAA rather than just one customer.

Q. *NWG analyzed data from a recent week and claimed that today's scheduling accuracy is actually likely to be very close to the 30-minute level. Dragoon, WP-10-E-NG-01, at 14-15. What is your response to this analysis?*

A. We acknowledge that there have been improvements in scheduling accuracy, but a one-week period is too brief to demonstrate general scheduling behavior, trends, or accuracy. As stated before, our analysis suggests the wind projects' recent scheduling accuracy and behavior are best represented by a 60-minute instantaneous persistence assumption.

Q. *PPC et al. maintains that "BPA would be speculating" about scheduling accuracy in the rate period if it were to move off the two-hour persistence model. Baker et al., WP-10-E-JP6-01, at 11. What is your response?*

A. BPA models the wind fleet scheduling patterns and accuracy based on observed behavior. Our recent analysis indicates that current scheduling accuracy reflects a 60-minute instantaneous persistence model.

Section 5: Allocation of the Total Reserve Requirement Between Load and Wind

Q. NWG testifies that BPA's proposed method for allocating the total reserve between wind and load is based on a relatively complex approximation of the incremental change in the total variability due to the addition of the last component and that the reserve should be allocated based on the additional reserve requirement actually needed for wind above that historically provided for load. Dragoon, WP-10-E-NG-01, at 20. What is your response?

A. Our proposed allocation method reflects the exact, instantaneous change in the total uncertainty in station control error with respect to the individual components of wind and load. We are not projecting how the reserve requirement changes if wind or load were completely removed from the calculation. It is only in trying to estimate the reserve with the wholesale addition/subtraction of wind/load where the calculation becomes approximate. Rather, we are calculating how wind and load are each contributing to the uncertainty in the total system station control error at a given point in time (wind fleet size). Stated differently, we are calculating how sensitive the uncertainty in total system station control error is with respect to the uncertainty in wind and load station control error for a given load and wind fleet size.

Our proposed method is analogous to calculating the instantaneous velocity from an equation relating time to distance. At a given point in time the velocity may be precisely calculated as a derivative of the function. However, if one attempts to project total distance traveled at another point in time using the previous derivation, discrepancies between the approximate projection and the actual value arise to the extent that the time-distance relationship is non-linear. This notion of projecting, which is not analogous to our proposed method, appears to be the crux of NWG's objection to our proposal.

Q. Does your proposed calculation allocate reserves based on the sources of unscheduled variation in the BPA BAA?

A. Yes. Specific demonstration of the intent behind our allocation proposal is perhaps better understood by working the problem from a slightly different direction. The chart in Exhibit 12 to this rebuttal testimony shows the imbalance portion of the station control errors of wind and load with respect to the imbalance portion of the total system station control error (load-net-wind error). The chart is based on applying the reserve calculation, assuming FY 2011 load and FY 2011 wind that reflects the updated installed wind capacity discussed previously in this testimony. The blue marks that extend at an angle through the origin reflect the wind error. The green marks that run somewhat vertically along the zero value of the y-axis reflect the load error. In this type of chart, if the wind error explained 100 percent of the total system error, the table would include a blue line passing through the origin at a 45-degree angle. In other words, the trend of the blue line in the chart reflects the fact that much of the total system error is attributable to the wind error. Likewise, load errors are uncorrelated with the total system error and explain very little of the total system error.

The goal of our proposal is to allocate the reserve requirement based on how much the total system error is attributable to its individual load and wind components. This analysis begins by calculating how many megawatts the total error changes given a 1 MW change in the load error and a 1 MW change in the wind error. Analytically, this is done by calculating the slope of the regression line between wind and the total error as well as the slope of the regression line between load and the total error. This yields the instantaneous rate of change in the total error with respect to the wind error and the load error, thus describing how sensitive the total error is with respect to wind and load. Although the slope values are useful in describing how much the total error changes for

each MW of wind error and load error, what is needed for allocating the reserve value is knowing how the uncertainty, or dispersion, in the wind and load error signals drive the uncertainty in the total error signal. The calculated slope coefficients may be used to show how much of the uncertainty in the wind error and load error is adding to the uncertainty in the total error. We have referred to this amount as the incremental standard deviation (ISD).

The slope value for wind – that is, the value describing how much the wind error drives the total system error – with respect to the total is then used to scale the variance of wind relative to the total load-net-wind error standard deviation. This calculation yields a wind standard deviation value that is adjusted for the strength and direction of its relationship to the total, load-net-wind error. This value is the ISD for wind. The calculation is repeated for load to arrive at the ISD for load. The ISD describes the uncertainty in the individual error signals scaled by how much the wind and load are each causing the total error and then taken in proportion to the total uncertainty (load-net-wind).

Q. NWG maintains that BPA has "misapplied" the ISD because it was designed for the financial services sector in assessing the risk of holding a large number of financial instruments. Dragoon, WP-10-E-NG-01, at 21. Do you agree?

A. No. As previously discussed, we are not projecting how the reserve requirement changes through the wholesale addition or subtraction of a component, wind or load, but is calculating the instantaneous contribution load and wind make to the current need for reserve at a given load and wind fleet size.

Q. NWG suggests allocating the reserve requirement by determining the additional reserve requirement actually needed for wind above that historically provided for load.

Dragoon, WP-10-E-NG-01, at 20. Why are you proposing to allocate the reserve based on the ISD versus the method proposed by NWG?

A. The intent of our proposed allocation is ultimately to charge for reserves based on wind's and load's contribution to the need to carry reserves while acknowledging the full diversity that may exist between the wind and load error signals. In this way, the source driving the present need for the reserve is being charged for the reserve.

Q. Does NWG's proposed allocation method fully account for and allocate the diversity between load and wind?

A. Not fully. Although NWG's suggested method calculates the total requirement and the incremental requirement with wind using the load-net-wind, or diversified, signal, load reserves are considered in isolation. Because loads are considered in isolation, load receives no benefit of error signal diversity. Conversely, by calculating the wind reserve need based on the total error signal, wind receives all of the diversity benefit. The end result of this calculation understates the reserve requirement for wind.

Q. NWG's witness testifies that in "every other study I am aware of in which an allocation was implied, the amount of reserves attributed to wind was the incremental need to hold reserves, above that already being held for load." Dragoon, WP-10-E-NG-01, at 19. What is your perspective on these studies?

A. NWG identified eight studies that it was referring to in response to a BPA data request. We reviewed the following studies out of the ones that were identified:

- Operational Impacts of Integrating Wind Generation into Idaho Power's Existing Resource Portfolio. Idaho Power. February 2007;
- Minnesota Wind Integration Study: Volume I. Prepared for: The Minnesota Public Utilities Commission. Prepared by: EnerNex Corporation. In Collaboration with: The Midwest Independent System Operator. November 30, 2006;

- Integrating Wind Energy With the BPA Power System: Preliminary Study. Eric Hirst. September 2002;
- We Energies Energy System Operations Impacts of Wind Generation Integration Study. Prepared for: We Energies. Prepared by: Electrotek Concepts, Inc. July 24, 2003;
- Assessing the Impact of Wind Generation on System Operations at Xcel Energy–North and Bonneville Power Administration;
- Avista Corporation Wind Integration Study. Prepared for: Avista Corporation. Prepared by: EnerNex Corporation. March 2007.

None of these studies has as an objective the assignment of the cost of reserves based on causation. Of the studies that do explicitly state how additional reserves are assigned to wind, the assignment is given without any particular reason or goal surrounding the allocation. We were not able to determine from the studies we reviewed why the chosen allocation was used, whether other allocation methods were considered, or the objective driving the chosen allocation method. None of the studies reviewed indicates or claims that its method of allocation is an industry standard.

Q. Do you have any other concerns with NWG's proposed calculation?

A. Yes. NWG's suggested method is not conducive to allocating the reserve beyond wind and load (or any two elements). If, for example, individual wind projects, as opposed to the aggregate fleet, and loads were all to be considered, NWG's suggested calculation would produce changing results depending on which project is integrated first, second, third, and so on. That is, if loads are calculated first, then wind project A, then wind project B, the result would be different from calculating the reserve based on loads first, wind project B second, and then wind project A. Our proposed allocation algorithm is insensitive to the order in which loads or resources are calculated.

Q. Are there any pricing implications associated with using NWG's proposed allocation calculation?

A. Yes. NWG did not address how reserves would be priced under its proposed allocation. If we were to implement the reserve allocation following NWG's proposal, the implication would be that BPA would need to establish tiered reserve rates. An allocation methodology under which load should bear no less than its historical reserve need implies that loads should be allocated the first batch of reserves from a pricing perspective. Under this method, all subsequent projects (in this case, wind projects) would bear the full cost of the increasingly expensive batches of reserve. This may not be NWG's intent with respect to its allocation proposal. From our perspective, however, pricing reserves should be consistent with the reserve calculation.

Section 6: Proposed Changes to the Methodology

Q. Are you proposing any changes to the forecast methodology that you used for the Initial Proposal?

A. Yes. Our direct testimony described a change to the load assumptions in the forecast methodology that we intended to make to better reflect how the system is set up by the hydro duty schedulers prior to the hour. McManus *et al.*, WP-10-E-BPA-23, at 24. We have made that change, and the impact was more significant than expected in terms of the increase in the amount of reserves allocated to wind.

In addition, we are proposing to incorporate a change to the calculation of the total reserve requirement. This proposed change will lower the overall requirement. We believe that both of these modifications result in a more accurate forecast of the rate period reserve requirement.

Q. Have you prepared reserve forecasts that reflect the impact of the various potential combinations of these proposed changes on the reserve requirement forecast for the rate period?

A. Yes. Exhibits 13 to 24 to this testimony provide detail about the impact of the different potential combinations of the proposed changes under 30-minute, 45-minute, and 60-minute persistence scheduling assumptions for wind schedules. These exhibits include the *inc* and *dec* numbers under each scenario, along with the rate period averages. The numbers in these exhibits are based on the updated estimate of installed capacity discussed in section 2 of this rebuttal testimony.

The following table shows how these exhibits are organized and identifies the inputs used for each forecast. For the sake of simplicity, the table and exhibits use "old" to refer to the methods used in the Initial Proposal. "New" refers to the method or assumption that we are proposing to change from the Initial Proposal. For example, Exhibit 13 includes the forecast of the total reserve requirement with the "old" total reserve calculation and the "old" load forecast assumption, which reflects the methods used in the Initial Proposal (applied to the updated estimate of the installed wind capacity).

Exhibit	**Reserve Component**	**Total Reserve Calculation**	**Load Forecast Assumption**
Exhibit 13	Total Reserve	Old	Old
Exhibit 14	Total Reserve	Old	New
Exhibit 15	Total Reserve	New	Old
Exhibit 16	Total Reserve	New	New
Exhibit 17	Wind	Old	Old
Exhibit 18	Wind	Old	New
Exhibit 19	Wind	New	Old
Exhibit 20	Wind	New	New
Exhibit 21	Load	Old	Old
Exhibit 22	Load	Old	New
Exhibit 23	Load	New	Old
Exhibit 24	Load	New	New

Q. What changes to the load forecast assumptions did you identify in direct testimony?

A. The load forecast assumptions used in the Initial Proposal reflected the raw numbers generated by the system load forecasting tool. These amounts are not the same numbers that the hydro duty schedulers use when setting up the system for the next hour. The experience of the duty schedulers has been that load errors tend to build over several hours. The change to the load forecast assumptions avoids carrying reserves into the hour for a load forecast error that was accounted for prior to the hour. The change to the load forecast assumptions rely on a model that better reflects the hydro duty schedulers' assumptions when they modify the load forecast in order to set up the system for the next hour. McManus *et al.*, WP-10-E-BPA-23, at 24.

Q. Did any parties comment on your proposal to update the load forecast assumptions prior to the Final Proposal in this case?

A. Yes. Public Power Council supported our proposal. Baker *et al.*, WP-10-E-JP6-01, at 22.

Q. Please explain the change to the load forecast assumptions.

A. BPA sets up the system every hour based on system conditions and estimates of the system conditions in the next hour. We modified the load forecast assumptions in the reserve forecast methodology to more accurately depict the methods used by the schedulers when setting up the system each hour. This consists of taking the actual load at 10 minutes prior to the hour and calculating the estimated load at 10 minute past the hour, 30 minutes past the hour, and 50 minutes past the hour. This is the same calculation that the software used by the schedulers performs when setting up the system for the next hour. The inputs to these estimates are the load at 10 minutes prior to the hour and the load forecasts for the current hour and the next two hours.

Q. What is the impact of this change on the load and wind reserve requirements relative to the total reserve requirement?

A. We expected that the new load forecast assumptions would result in allocating a more significant portion of the total reserve requirement to wind, but the allocation to wind was greater than anticipated. Under a 60-minute persistence forecast for wind schedules and the updated estimate of installed wind capacity, the rate period average for the total reserve requirement decreases by 54 MW *inc* and 36 MW *dec* with this change. *See* Exhibits 13 and 14. The rate period average for the wind reserve *inc* increases by 285 MW, and the average wind reserve *dec* increases by 456 MW. *See* Exhibits 17 and 18. The average load reserve *inc* for the rate period decreases by 339 MW, and the average load reserve *dec* decreases by 494 MW. *See* Exhibits 21 and 22.

Q. What change do you propose to the calculation of the total reserve requirement?

A. In the Initial Proposal, we calculated the total reserve requirement by determining the *inc* and *dec* amounts for each component of the reserve requirement for each hour of the day. We discarded 0.25 percent of the upper and lower values for each component for each hour, leaving 99.5 percent of the values for calculating the capacity requirements of the BPA BAA. This produced a forecast of the capacity that BPA needs to meet its balancing requirements 99.5 percent of the time. Using the 99.5 percent of values for each component for each hour, we forecast the total reserve requirement based on the maximum value for the 24-hour series for each of the total actual wind generation, total actual BAA load, and actual load net wind datasets. The maximum values for the actual load net wind dataset represent a forecast of BPA's total reserve requirement. McManus *et al.*, WP-10-E-BPA-23, at 18-20; Study, WP-10-E-BPA-08, at 21-22.

The change that we propose to make calculates the total reserve requirement based on using 99.5 percent of the values from the total datasets for regulation, load following, and imbalance rather than the maximum of 99.5 percent of the values of the dataset for each hour of the day of the rate period. We then take the maximum *inc* and *dec* values from the full dataset for each component as the forecast of the total reserve requirement. In other words, for the initial proposal, we calculated the 99.5th percentile for each hour of day and took the maximum value from the 24 resultant numbers for the total reserve requirement. The primary change that we are proposing now is that we discard the data reflecting the most extreme events from datasets that include all the *inc* and *dec* values for a particular component rather than the data reflecting the most extreme events for each of the hour of day datasets for the rate period. The same amount of data is discarded under either method, but the methodology used in the Initial Proposal resulted in the inclusion of some extreme ramping events that should have been

discarded, because they were on the outside of the 99.5 percent of values for the total data set. For example, assume that there were multiple extreme ramp events for hour of day 1:00 p.m. to 2:00 p.m. Since that dataset is 1/24th of the total dataset, not all of the extreme events would fall outside the 99.5 percent of values remaining after discarding the most extreme events. However, when the full dataset is used to calculate the 99.5 percent, all of those extreme events in that hour would have been discarded because they were outliers when compared to the full dataset.

Q. Have you attempted to quantify the impact of this change?

A. Yes. Assuming 60-minute persistence scheduling accuracy and the updated installed capacity estimates, this change appears to reduce the average total reserve requirement for the rate period by 262 MW for the *inc* and 474 MW for the *dec*. *See* Exhibits 13 and 15.

Q. Have you examined the cumulative impact of both the total reserve calculation change and the change in the load forecast assumptions?

A. Yes. When both of the modifications were made in the calculations, the total average reserve requirement for the rate period went from 1471 to 1089 MW for the *inc* and -1881 to -1340 MW for the *dec*. *See* Exhibits 13 and 16. The average wind reserve requirement went from 762 to 803 MW for the *inc* and from -1029 to -1079 MW for the *dec*. *See* Exhibits 17 and 20. The average load reserve requirement went from 709 to 285 MW for the *inc* and -852 to -260 MW for the *dec*. *See* Exhibits 21 and 24. Again, these numbers assume 60-minute persistence accuracy for the wind schedules and the updated estimate of installed capacity.

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Exhibits 1-24

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DATA REQUEST NUMBER TO REFERENCE:
BPA-IR-1

RESPONSE BY:
Lara Skidmore - Iberdrola Renewables, Inc.

ORIGINAL DATA REQUEST:
Please provide a list of the BPA Generator Interconnection Queue Request Numbers or Project Names for each of the Interconnection Requests that Iberdrola "has plans to delay up to 500 MW."

EXHIBIT: Direct Testimony of Iberdrola Renewables WP-10-E-IR-01

PAGE(S): 25
LINE(S): 10-16

DATA RESPONSE: (NOTE: You MUST log in to the site in order to view any documents)

--TEXT DESCRIPTION:
The following interconnection requests have been withdrawn or have a delay in the project online date:

- G0279 - Withdrawn on 3/10/2009
- G0280 - delay in project online date
- G0242- delay in project online date
- G0275- delay in project online date

For technical questions about this request please contact Lara Skidmore by phone (5035902979) or email (lara.skidmore@troutmansanders.com)

If you do not wish to receive notification of data responses from this system, please log into your account, select "Account" on the left hand menu and clear the checkboxes next to the setting marked "Email data response notifications."

DATA REQUEST NUMBER TO REFERENCE:
BPA-NG-1

RESPONSE BY:
Stephen Hall - Northwest Wind Group

ORIGINAL DATA REQUEST:
Regarding the testimony of Ken Dragoon on BPA's Proposed Wind Balancing Service Rate and Intentional Deviation Penalty, please provide all documents or information that refer or relate to plans by Northwest Wind Group members to delay beyond the end of the rate period the development of wind projects with interconnection requests in the BPA queue.

EXHIBIT: Qualification Statement of Ken Dragoon WP-10-E-NG-01

PAGE(S): 17
LINE(S): 1-20

DATA RESPONSE: (NOTE: You MUST log in to the site in order to view any documents)

--TEXT DESCRIPTION:
This question misconstrues NWG's testimony regarding BPA's Proposed Wind Balancing Service Rate and Intentional Deviation Penalty. NWG's testimony referenced in the Data Request does not state or allude to any "plans by Northwest Wind Group members to delay" the development of wind projects beyond the rate period. NWG's testimony points out that certain intervening events warrant the reexamination of the installed wind capacity assumption for this rate period. For example, Puget Sound Energy has recently indicated that it intends to remove its Hopkins Ridge wind facility from BPA's Control Area through dynamic scheduling. Pertinent information to this data request can also be found in the responses to BPA-IR-1 and BPA-IR-4, included below. NWG's testimony also references "delays" due to BPA's interconnection "hiatus." Additionally, Horizon Wind Energy LLC has 1800 MWs in BPA's queue that was originally planned with a Commercial Operation Date of FY 2011, but which Horizon has had to push back to FY 2013 because BPA recently informed Horizon that the West of McNary transmission upgrade will be required. Horizon submitted revised CODs for the queue, but the dates have not yet been updated on BPA's website.

IBERDROLA RESPONSE TO DATA REQUEST BPA-IR-1:
Date Response Filed: 4/1/2009 8:44:34 PM
Contact Name: Lara Skidmore
Contact Phone: 503.590.2979
Contact Email: lara.skidmore@troutmansanders.com
Response Text:
The following interconnection requests have been withdrawn or have a delay in the project online date: o G0279 - Withdrawn on 3/10/2009 o G0280 - delay in project online date o G0242- delay in project online date o G0275- delay in project online date

IBERDROLA RESPONSE TO DATA REQUEST BPA-IR-4:
Date Response Filed: 4/1/2009 8:49:12 PM
Contact Name: Lara Skidmore
Contact Phone: 503.590.2979
Contact Email: lara.skidmore@troutmansanders.com
Response Text:

Many things can happen between the time an interconnection request is submitted and the time the upgrades are complete and a project is brought online. When a customer submits a request, the magnitude of upgrades required to bring a project online (timing and costs) are often unknown. Other unknowns that may affect a project's timing or cost include permitting issues, landowner issues, environmental impacts, etc. Often project online dates are modified and projects are delayed or cancelled as a result of the interconnection and transmission studies the transmission provider performs. Such study results are the primary reason Iberdrola currently anticipates delays for the three interconnection requests referenced above. Through conversations with Bonneville and/or from preliminary interconnection study results, Iberdrola understands that the upgrades associated with these facilities won't be complete until after the rate period, or a preliminary assessment of the upgrades has resulted in a higher than expected cost for Iberdrola to proceed. Under the latter scenario, Iberdrola has either requested alternative routing studies, which would result in a delay in the online date to beyond the rate period, or Iberdrola understands that the Network Open Season upgrades, which are scheduled to be complete after the rate period, would be a more cost-effective alternative to bring the project online. Since the delay in the three projects mentioned in BPA-IR-1 is a result of discussions with Bonneville and analysis performed prior to the execution of an interconnection agreement, it is premature to determine whether Iberdrola will suspend an executed agreement.

For technical questions about this request please contact Stephen C. Hall by phone (5032949625) or email (schall@stoel.com)

MONTHLY WIND GENERATION SUMMARY

3/1/2009	Begin Date
3/31/2009	End Date

EXHIBIT 3
CORRELATION MATRIX
Based on Actual MW Generation by hour

CORRELATION MATRIX Based on Actual MW Generation by hour (assessing "WIND DIVERSITY" of Actual Energy Output)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	TOTAL WIND	TOTAL CONTROL AREA LOAD
A		0.831	0.748	0.702	0.856	0.739	0.659	0.792	0.824	0.850	0.817	0.964	0.623	0.933	0.705	0.687	0.832	0.898	0.941	0.072
B			0.616	0.714	0.877	0.632	0.725	0.655	0.680	0.700	0.681	0.816	0.750	0.819	0.773	0.750	0.930	0.774	0.904	0.019
C				0.545	0.705	0.629	0.509	0.689	0.773	0.756	0.708	0.764	0.467	0.705	0.567	0.550	0.664	0.730	0.778	0.077
D					0.715	0.737	0.602	0.672	0.638	0.679	0.691	0.699	0.647	0.670	0.689	0.682	0.681	0.650	0.777	0.043
E						0.707	0.679	0.752	0.791	0.804	0.774	0.854	0.692	0.848	0.741	0.728	0.910	0.820	0.930	0.001
F							0.524	0.862	0.818	0.846	0.882	0.739	0.500	0.712	0.574	0.554	0.647	0.688	0.810	0.046
G								0.514	0.545	0.558	0.536	0.657	0.725	0.650	0.776	0.759	0.698	0.633	0.764	0.106
H									0.933	0.956	0.965	0.784	0.476	0.759	0.564	0.538	0.672	0.757	0.850	0.010
I										0.970	0.940	0.829	0.508	0.788	0.605	0.578	0.728	0.798	0.883	0.029
J											0.975	0.849	0.507	0.812	0.609	0.585	0.733	0.821	0.900	0.020
K												0.810	0.490	0.779	0.587	0.564	0.698	0.786	0.875	0.031
L													0.617	0.937	0.719	0.704	0.835	0.913	0.941	0.070
M														0.632	0.865	0.807	0.701	0.584	0.730	0.064
N															0.707	0.682	0.827	0.902	0.924	0.067
O																0.936	0.759	0.703	0.813	0.084
P																	0.745	0.684	0.789	0.082
Q																		0.790	0.915	0.028
R																			0.901	0.070
GRAND TOTAL WIND																				0.054
TOTAL CONTROL AREA LOAD																				

Notes:
The correlation coefficient is a measure of the extent to which two data quantities tend to vary in similar or different ways.
The correlation coefficient varies from -1 to +1.
A high Positive correlation (~ +0.5 and higher) means that the two quantities tend to vary in the same direction.
As one goes up the other tends to go up; as one goes down, the other tends to go down.
A high Negative correlation (~ -0.5 and lower) means that the two quantities tend to vary in opposite directions.
As one goes up the other tends to go down; as one goes down, the other tends to go up.
Higher correlations (either positive or negative) indicate higher predictability of one quantity if the other quantity is known.
Lower correlations (~ -0.5 thru +0.5) indicate less predictability between the two quantities.
High Negative, or Low, Correlations (Pos or Neg) between the wind plants would mean greater generation diversity

MONTHLY WIND GENERATION SUMMARY

3/1/2009	Begin Date
3/31/2009	End Date

EXHIBIT 4
CORRELATION MATRIX
Based on 5-Min MW Generation Changes (Deltas)

CORRELATION MATRIX Based on 5-Min MW Generation Changes (Deltas) (assessing "WIND DIVERSITY" of Short-Term Changes)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	TOTAL WIND	TOTAL CONTROL AREA LOAD
A		0.144	0.016	0.009	0.026	-0.009	-0.001	0.010	-0.006	0.021	0.006	0.371	0.011	0.099	0.011	0.015	0.100	0.036	0.346	0.002
B			0.004	0.021	0.041	-0.021	0.006	-0.031	-0.024	-0.015	-0.022	0.103	0.016	0.093	-0.011	0.018	0.261	0.035	0.394	-0.014
C				0.006	0.065	0.057	0.001	0.087	0.147	0.152	0.117	0.033	-0.004	0.007	0.000	-0.014	0.003	-0.009	0.276	-0.009
D					0.033	0.000	-0.001	0.017	-0.001	0.001	-0.023	0.034	-0.006	-0.004	0.014	0.049	0.051	-0.015	0.118	0.007
E						0.000	-0.027	0.031	0.063	0.094	0.058	0.033	-0.011	0.003	0.011	0.023	0.032	0.010	0.253	0.000
F							0.024	0.138	0.145	0.137	0.168	0.020	0.000	0.002	-0.010	-0.001	0.004	-0.008	0.290	0.005
G								-0.023	-0.027	-0.003	-0.022	-0.018	0.035	0.015	-0.009	-0.006	-0.001	0.008	0.266	0.020
H									0.302	0.363	0.315	-0.017	-0.003	-0.017	-0.007	0.005	0.007	-0.019	0.298	-0.010
I										0.403	0.315	-0.020	0.017	0.010	-0.002	-0.016	-0.004	0.007	0.391	-0.007
J											0.484	0.010	0.014	0.030	0.000	0.017	-0.001	-0.035	0.533	-0.005
K												-0.012	0.025	0.016	-0.011	0.017	-0.008	-0.031	0.399	-0.013
L													0.001	0.149	0.004	0.024	0.106	0.050	0.338	0.004
M														0.006	0.049	0.035	0.004	0.032	0.119	0.007
N															-0.007	0.010	0.047	0.068	0.258	-0.009
O																0.054	-0.044	-0.036	0.130	0.017
P																	0.001	0.006	0.084	0.005
Q																		0.004	0.397	0.014
R																			0.173	-0.002
TOTAL WIND																				0.011
TOTAL CONTROL AREA LOAD																				

Notes:
The correlation coefficient is a measure of the extent to which two data quantities tend to vary in similar or different ways.
The correlation coefficient varies from -1 to +1.
A high Positive correlation (~ +0.5 and higher) means that the two quantities tend to vary in the same direction.
As one goes up the other tends to go up; as one goes down, the other tends to go down.
A high Negative correlation (~ -0.5 and lower) means that the two quantities tend to vary in opposite directions.
As one goes up the other tends to go down; as one goes down, the other tends to go up.
Higher correlations (either positive or negative) indicate higher predictability of one quantity if the other quantity is known.
Lower correlations (~ -0.5 thru +0.5) indicate less predictability between the two quantities.
High Negative, or Low, Correlations (Pos or Neg) between the wind plants would mean greater generation diversity

MONTHLY WIND GENERATION SUMMARY

3/1/2009	Begin Date
3/31/2009	End Date

EXHIBIT 5
CORRELATION MATRIX
Based on 30-Min MW Generation Changes (Deltas)

CORRELATION MATRIX Based on 30-Min MW Generation Changes (Deltas) (assessing "WIND DIVERSITY" of Short-Term Changes)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	TOTAL WIND	TOTAL CONTROL AREA LOAD
A		0.265	0.061	0.058	0.109	0.020	0.022	0.049	0.042	0.097	0.046	0.653	0.020	0.403	0.002	0.062	0.234	0.189	0.498	-0.008
B			0.049	0.066	0.160	-0.001	0.050	0.000	-0.013	-0.004	0.000	0.234	0.045	0.205	-0.053	0.011	0.499	0.121	0.474	-0.044
C				-0.011	0.169	0.128	0.002	0.204	0.304	0.297	0.241	0.069	0.007	0.004	-0.008	-0.025	0.057	-0.008	0.373	-0.002
D					0.052	0.016	0.007	0.059	0.015	0.054	0.019	0.085	0.015	0.000	0.032	0.059	0.066	-0.038	0.143	-0.034
E						0.036	-0.033	0.115	0.174	0.198	0.141	0.118	0.001	0.044	0.014	0.053	0.231	0.040	0.375	-0.018
F							0.050	0.302	0.243	0.296	0.388	0.043	0.025	0.054	-0.023	-0.005	0.005	-0.017	0.353	-0.014
G								-0.048	-0.018	-0.031	-0.021	-0.002	0.073	0.015	-0.014	-0.030	0.015	0.022	0.222	0.022
H									0.645	0.691	0.717	0.012	0.012	0.056	0.003	0.018	0.007	-0.059	0.488	-0.025
I										0.733	0.628	0.016	0.015	0.054	-0.003	-0.027	0.022	-0.036	0.540	-0.009
J											0.788	0.066	-0.002	0.100	-0.002	0.007	0.034	-0.026	0.635	-0.031
K												0.017	0.031	0.068	0.008	0.022	0.006	-0.024	0.561	-0.030
L													0.023	0.465	0.006	0.058	0.209	0.244	0.480	-0.022
M														0.037	0.162	0.090	0.006	-0.007	0.129	0.029
N															-0.028	0.007	0.147	0.325	0.414	-0.005
O																0.364	-0.037	-0.023	0.105	0.016
P																	0.034	-0.015	0.108	0.013
Q																		0.090	0.481	0.017
R																			0.244	-0.008
TOTAL WIND																				-0.021
TOTAL CONTROL AREA LOAD																				

Notes:
The correlation coefficient is a measure of the extent to which two data quantities tend to vary in similar or different ways.
The correlation coefficient varies from -1 to +1.
A high Positive correlation (~ +0.5 and higher) means that the two quantities tend to vary in the same direction.
As one goes up the other tends to go up; as one goes down, the other tends to go down.
A high Negative correlation (~ -0.5 and lower) means that the two quantities tend to vary in opposite directions.
As one goes up the other tends to go down; as one goes down, the other tends to go up.
Higher correlations (either positive or negative) indicate higher predictability of one quantity if the other quantity is known.
Lower correlations (~ -0.5 thru +0.5) indicate less predictability between the two quantities.
High Negative, or Low, Correlations (Pos or Neg) between the wind plants would mean greater generation diversity

MONTHLY WIND GENERATION SUMMARY

3/1/2009	Begin Date
3/31/2009	End Date

EXHIBIT 6
CORRELATION MATRIX
Based on 60-Min MW Generation Changes (Deltas)

CORRELATION MATRIX Based on 60-Min MW Generation Changes (Deltas) (assessing "WIND DIVERSITY" of Short-Term Changes)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	TOTAL WIND	TOTAL CONTROL AREA LOAD
A		0.311	0.190	0.067	0.224	0.070	0.036	0.147	0.175	0.241	0.165	0.739	0.035	0.550	0.013	0.048	0.290	0.346	0.598	-0.023
B			0.134	0.089	0.284	0.034	0.098	0.065	0.073	0.083	0.077	0.270	0.061	0.241	-0.040	0.030	0.585	0.182	0.524	-0.070
C				-0.001	0.222	0.145	0.016	0.232	0.354	0.328	0.258	0.164	0.025	0.081	0.004	0.007	0.168	0.070	0.429	-0.004
D					0.068	0.063	-0.008	0.090	0.029	0.094	0.073	0.098	0.037	0.010	0.052	0.083	0.073	-0.001	0.164	-0.062
E						0.028	-0.032	0.175	0.237	0.259	0.193	0.232	0.035	0.180	0.023	0.091	0.400	0.164	0.470	-0.024
F							0.061	0.403	0.320	0.366	0.477	0.097	0.040	0.091	0.004	0.006	0.031	0.032	0.388	-0.024
G								-0.027	0.000	-0.005	0.000	0.016	0.086	0.009	0.036	-0.012	0.034	0.030	0.225	0.030
H									0.731	0.788	0.810	0.126	0.013	0.155	0.037	0.030	0.093	0.033	0.572	-0.043
I										0.825	0.733	0.154	0.024	0.148	0.022	-0.001	0.150	0.052	0.629	-0.019
J											0.860	0.215	-0.001	0.210	0.017	0.007	0.146	0.094	0.701	-0.048
K												0.159	0.025	0.167	0.043	0.034	0.100	0.068	0.635	-0.044
L													0.043	0.592	0.031	0.078	0.259	0.410	0.579	-0.038
M														0.040	0.304	0.172	0.030	-0.015	0.152	0.031
N															-0.007	0.029	0.225	0.458	0.514	0.000
O																0.551	-0.001	-0.008	0.148	0.024
P																	0.034	-0.001	0.141	0.025
Q																		0.199	0.557	0.013
R																			0.377	-0.013
TOTAL WIND																				-0.036
TOTAL CONTROL AREA LOAD																				

Notes:
The correlation coefficient is a measure of the extent to which two data quantities tend to vary in similar or different ways.
The correlation coefficient varies from -1 to +1.
A high Positive correlation (~ +0.5 and higher) means that the two quantities tend to vary in the same direction.
As one goes up the other tends to go up; as one goes down, the other tends to go down.
A high Negative correlation (~ -0.5 and lower) means that the two quantities tend to vary in opposite directions.
As one goes up the other tends to go down; as one goes down, the other tends to go up.
Higher correlations (either positive or negative) indicate higher predictability of one quantity if the other quantity is known.
Lower correlations (~ -0.5 thru +0.5) indicate less predictability between the two quantities.
High Negative, or Low, Correlations (Pos or Neg) between the wind plants would mean greater generation diversity

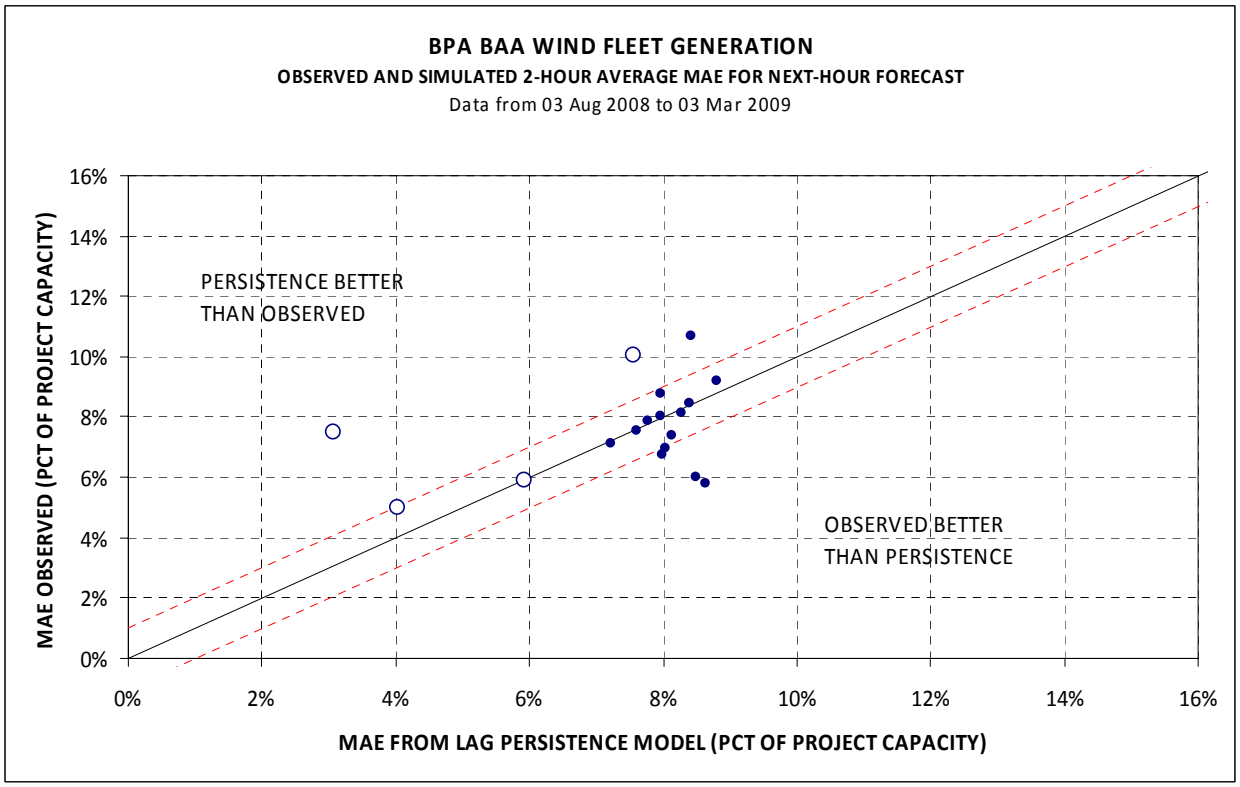

Figure 1 – Observed MAE and simulated MAE from 2-hour average persistence. Projects added since the prior analysis are represented as open circles.

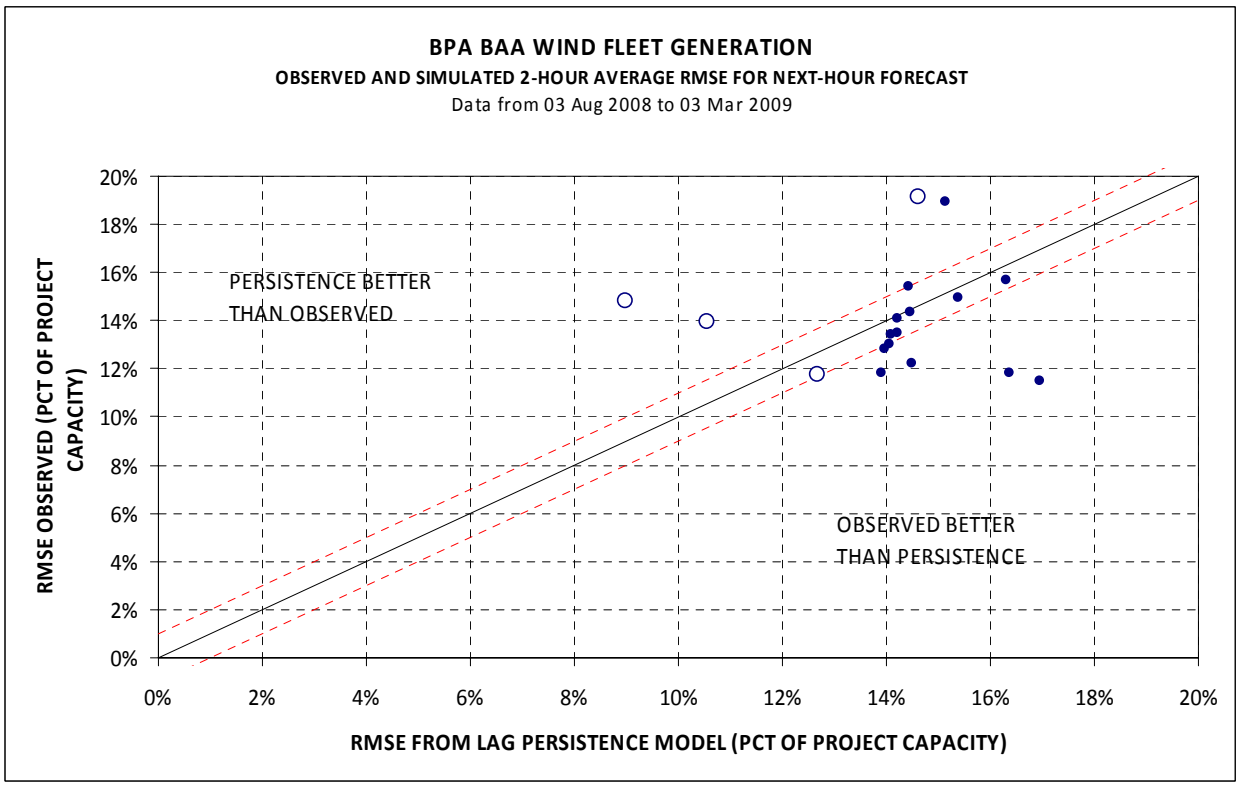

Figure 2 – Observed RMSE and simulated RMSE from 2-hour average persistence. Projects added since the prior analysis are represented as open circles.

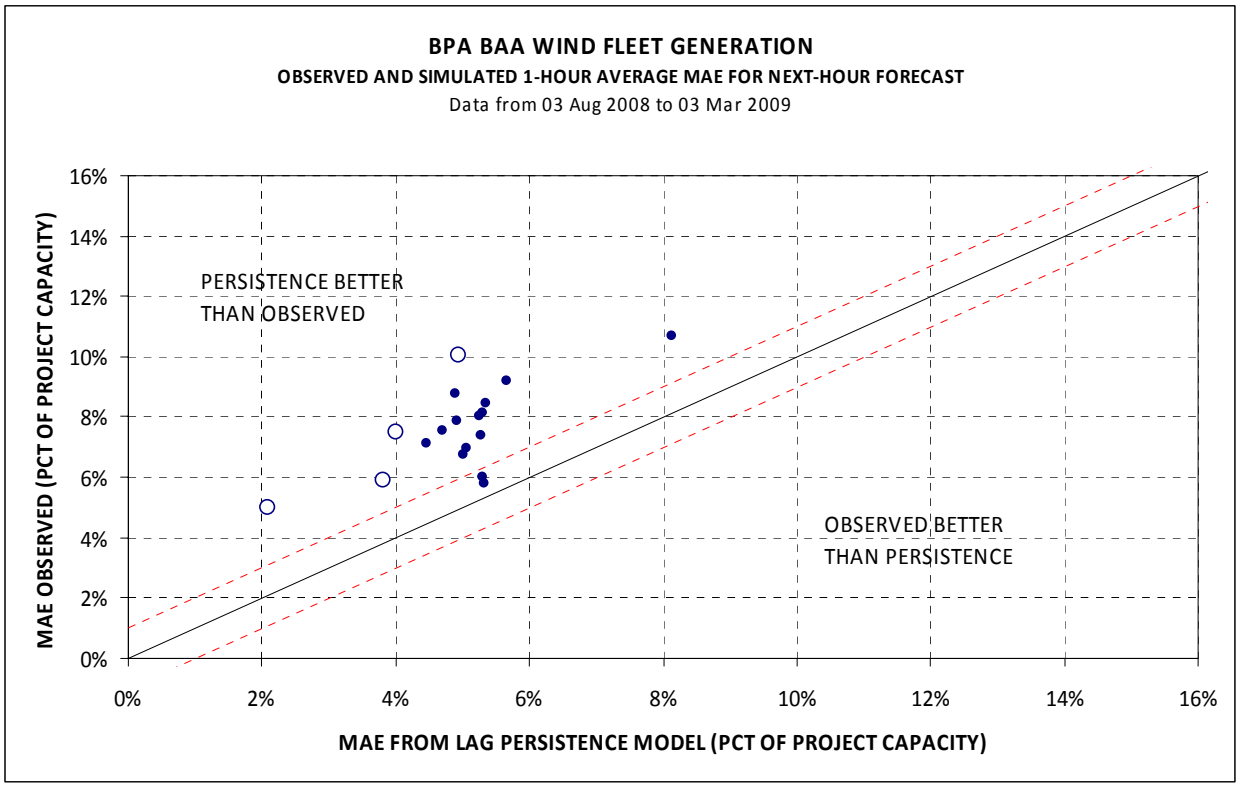

Figure 3 – Observed MAE and simulated MAE from 1-hour average persistence. Projects added since the prior analysis are represented as open circles.

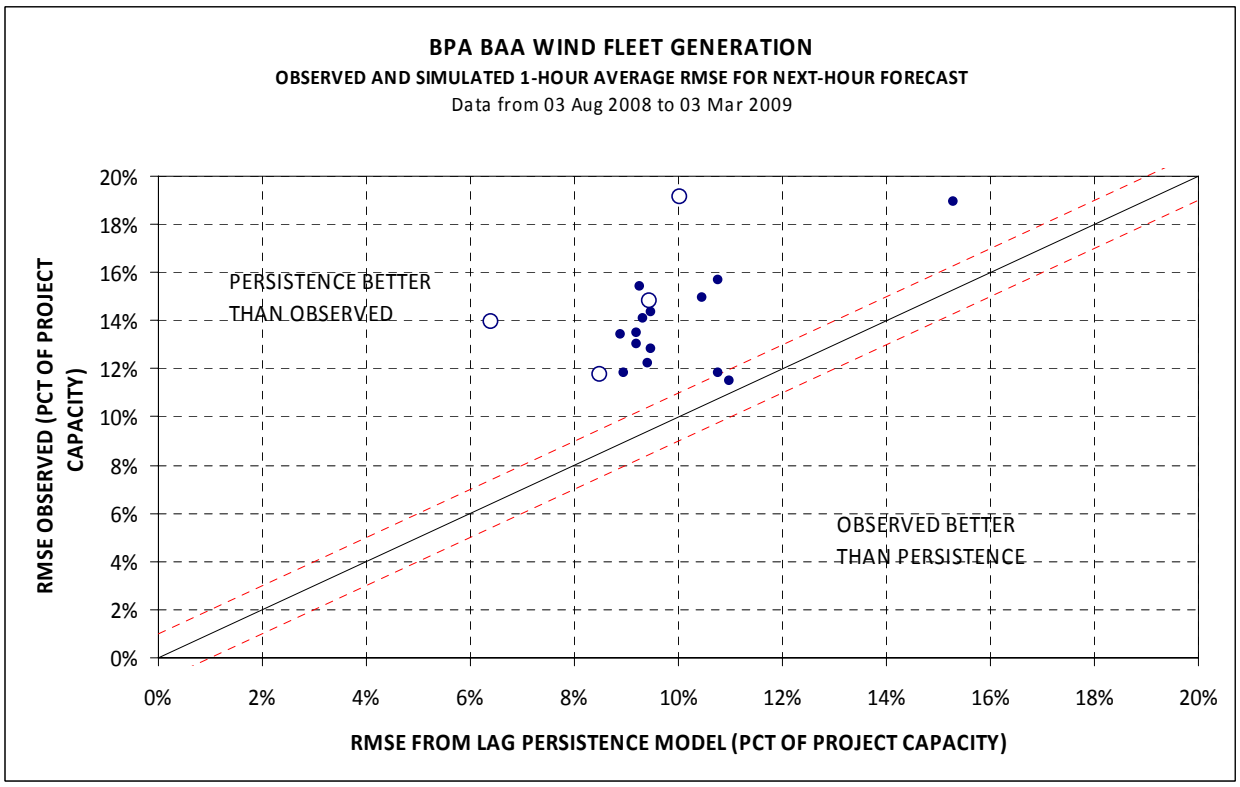

Figure 4 – Observed RMSE and simulated RMSE from 1-hour average persistence. Projects added since the prior analysis are represented as open circles.

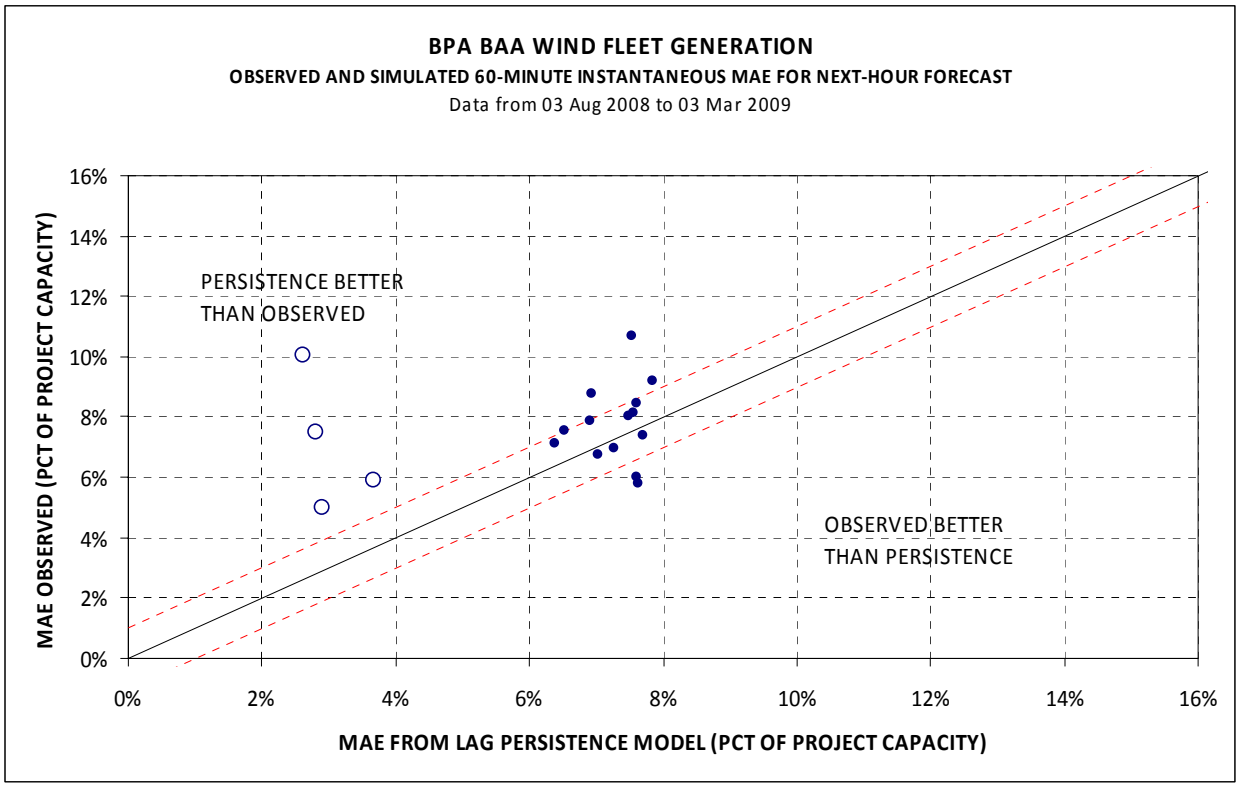

Figure 5 – Observed MAE and simulated MAE from 60-minute instantaneous persistence. Projects added since the prior analysis are represented as open circles.

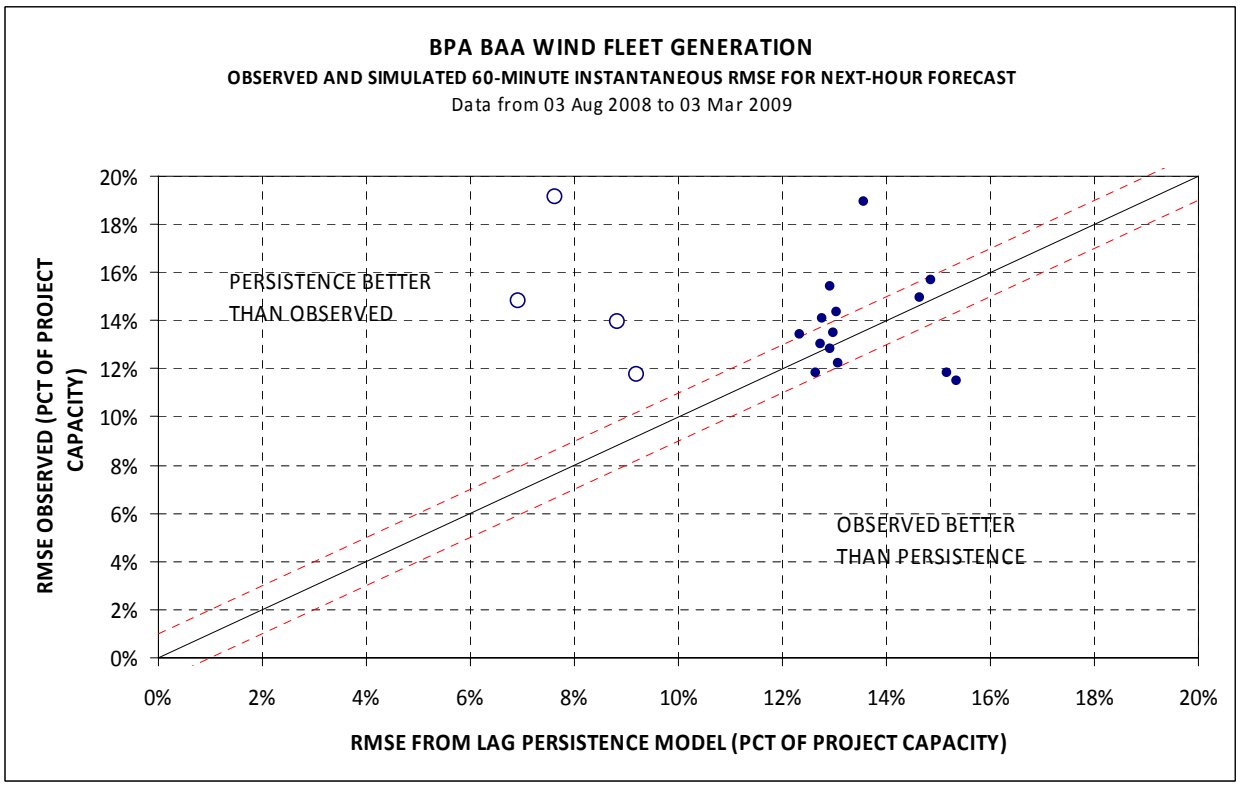

Figure 6 – Observed RMSE and simulated RMSE from 60-minute instantaneous persistence. Projects added since the prior analysis are represented as open circles.

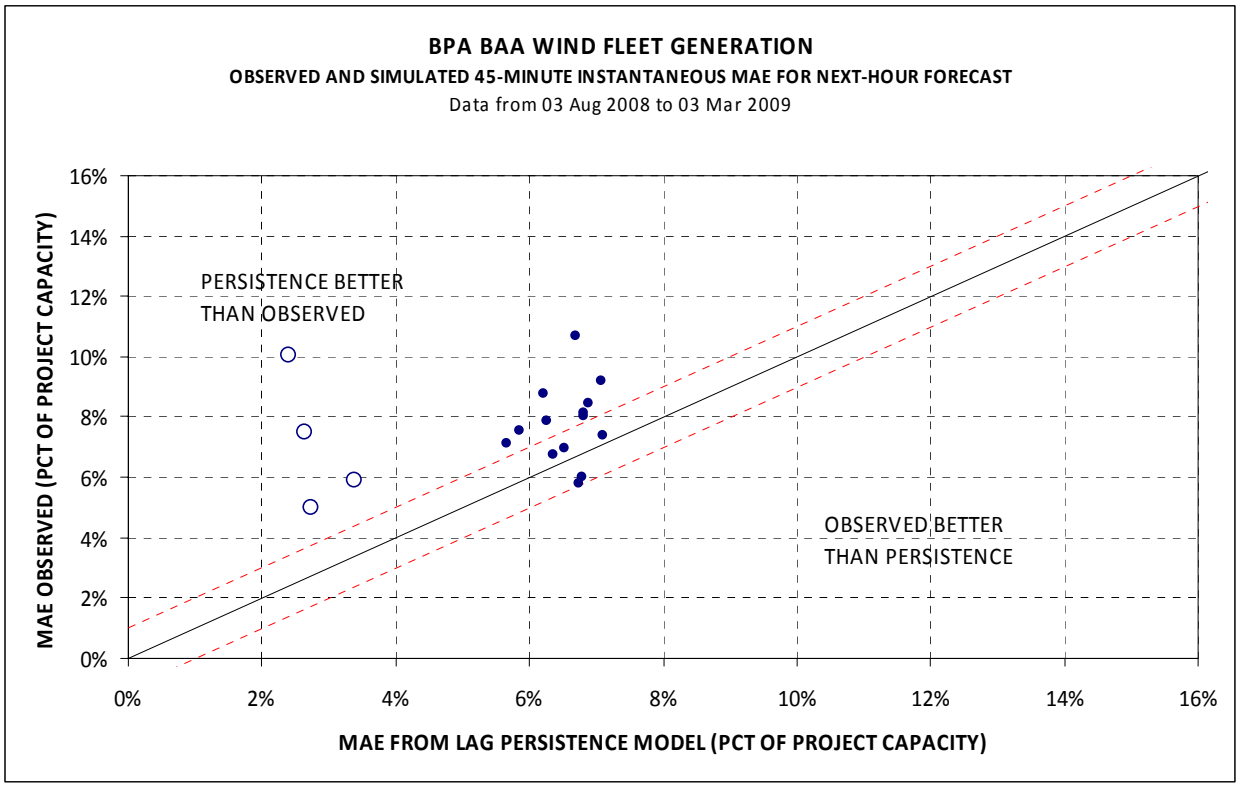

Figure 7 – Observed MAE and simulated MAE from 45-minute instantaneous persistence. Projects added since the prior analysis are represented as open circles.

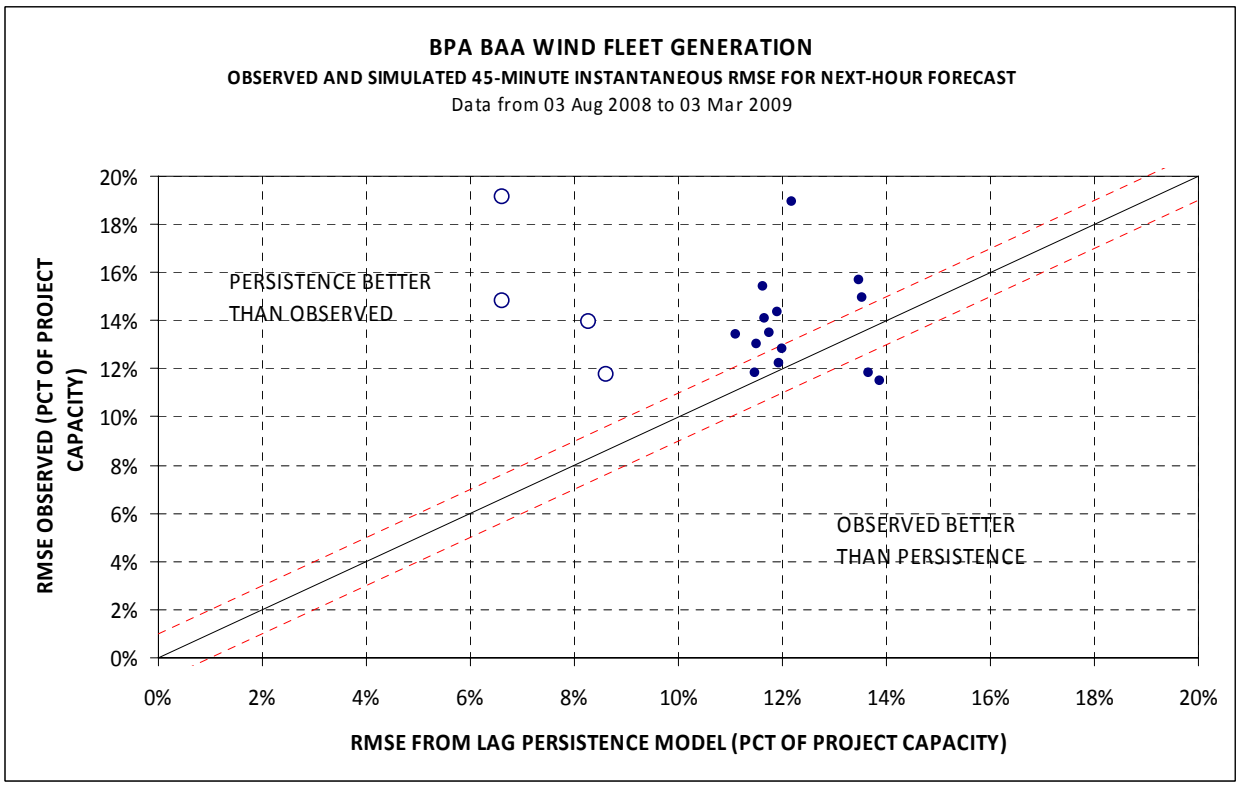

Figure 8 – Observed RMSE and simulated RMSE from 45-minute instantaneous persistence. Projects added since the prior analysis are represented as open circles.

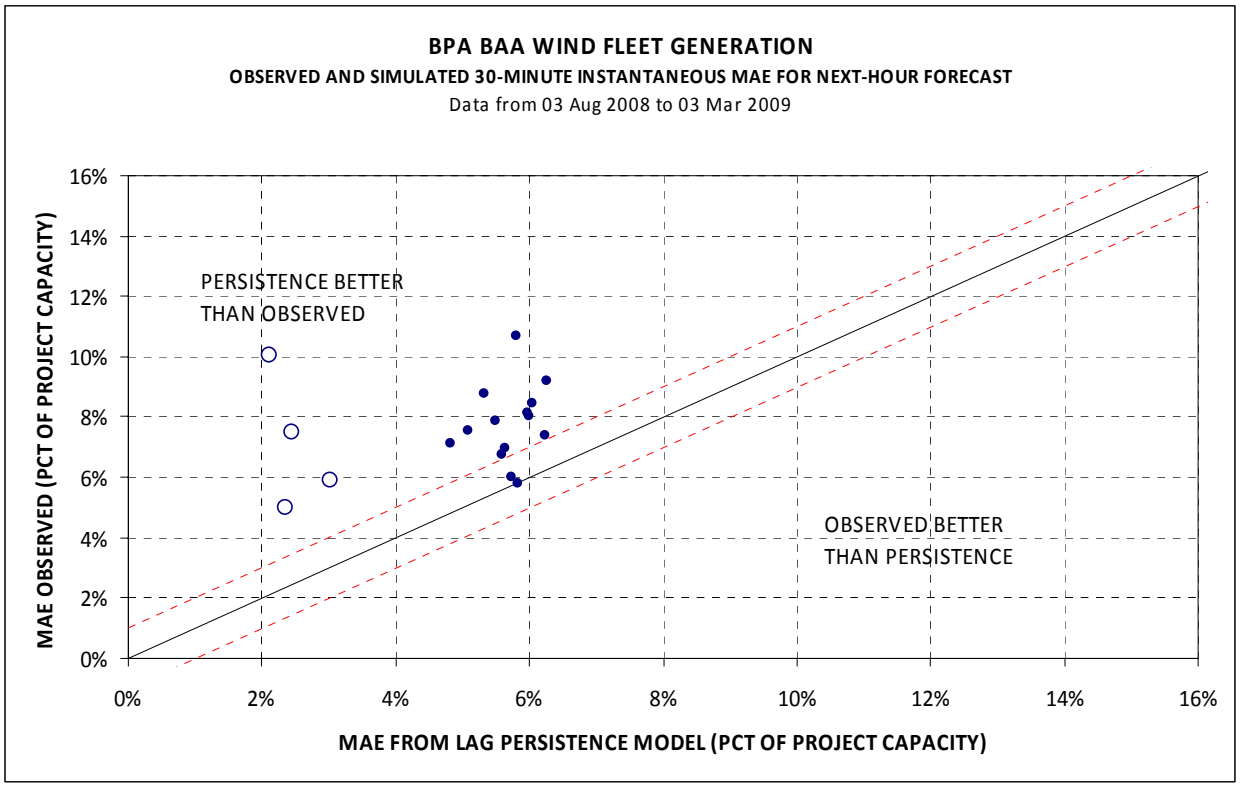

Figure 9 – Observed MAE and simulated MAE from 30-minute instantaneous persistence. Projects added since the prior analysis are represented as open circles.

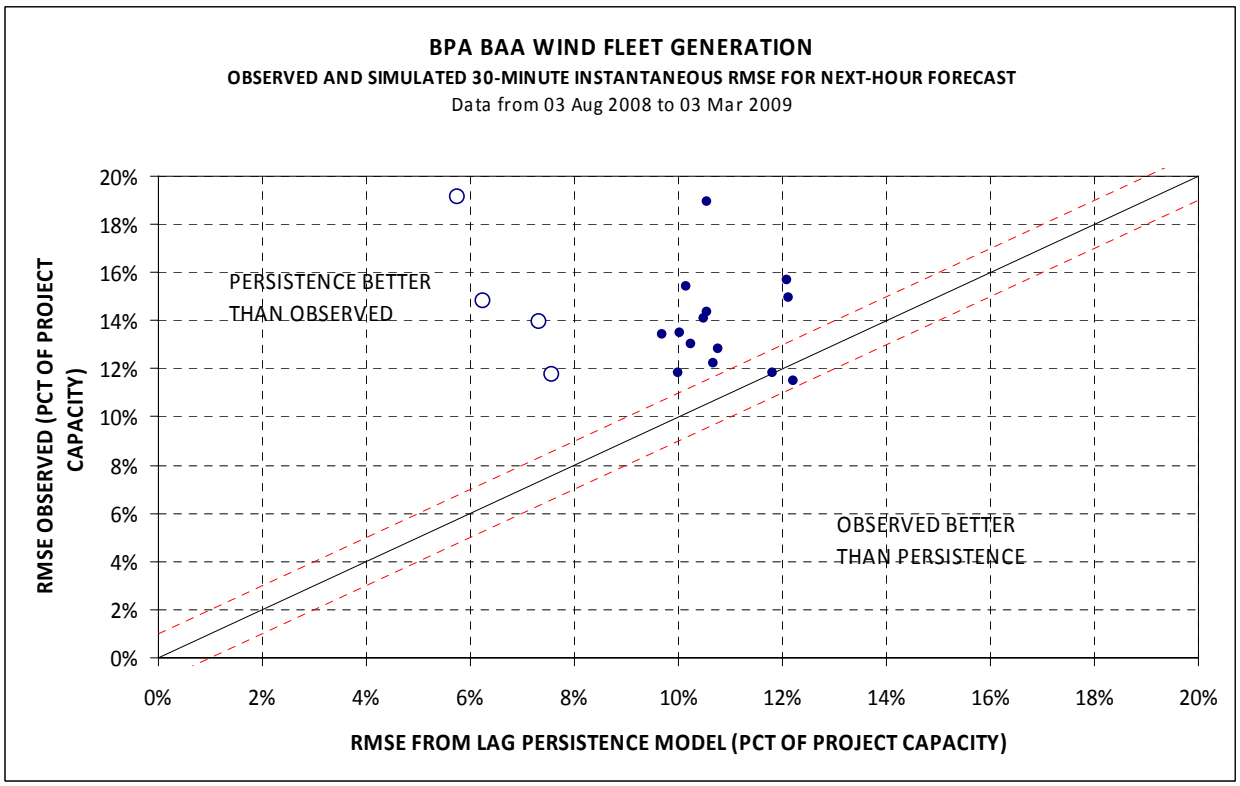

Figure 10 – Observed RMSE and simulated RMSE from 30-minute instantaneous persistence. Projects added since the prior analysis are represented as open circles.

Exhibit 12 - Wind Imbalance and Load Imbalance vs. Total Imbalance

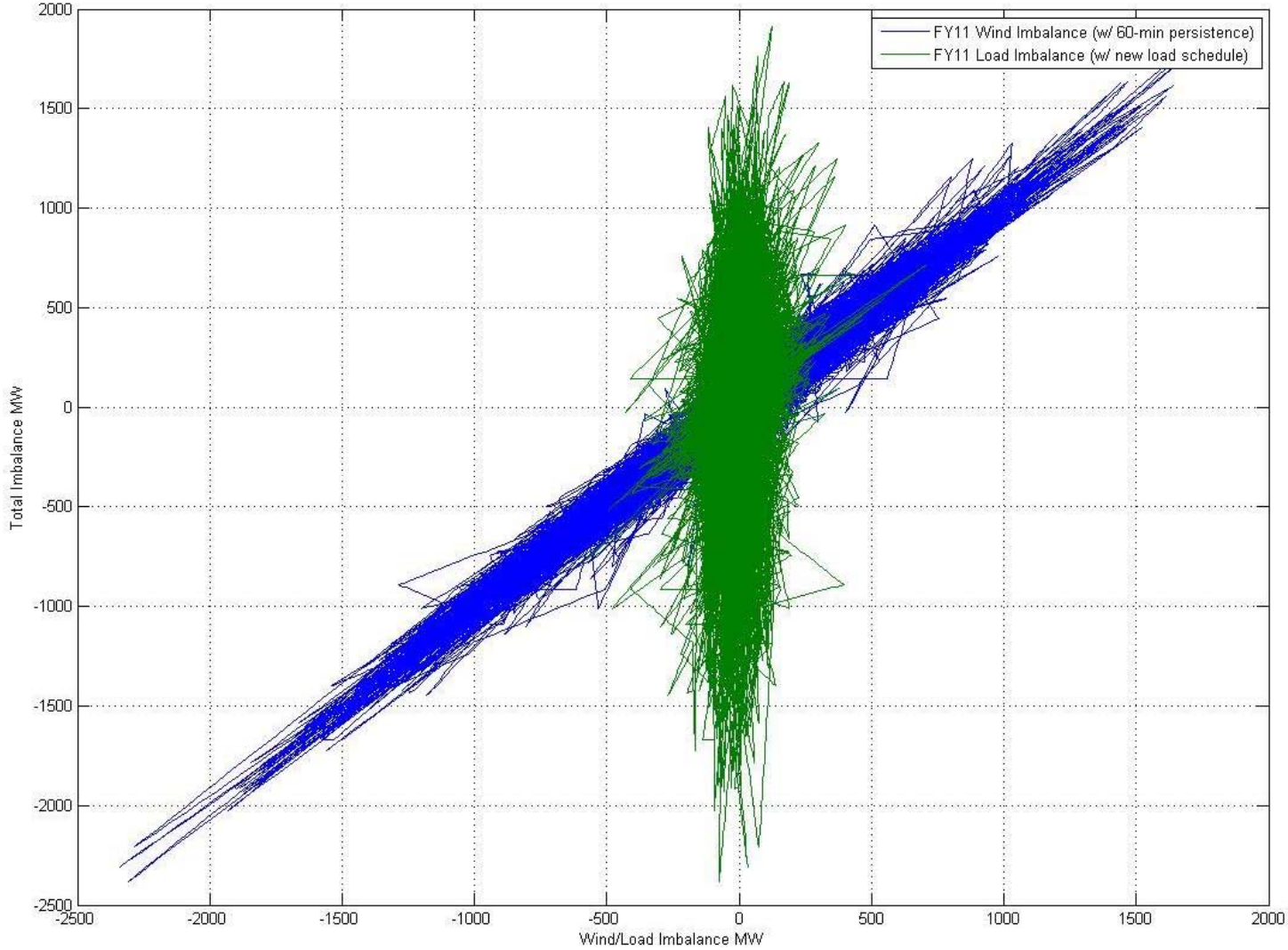

Exhibit 13: Total Reserve - Old Total Reserve/Old Load Input

			Total(2 Hr Avg)		Total(1 Hr)		Total(45 min)		Total(30 min)	
	Date	Capacity	Inc	Dec	Inc	Dec	Inc	Dec	Inc	Dec
	A	B	C	D	E	F	G	H	I	J
1	Oct-09	2111 MW	1,250.3	-1,590.6	1,165.1	-1,394.0	1,077.6	-1,308.6	1,022.8	-1,272.1
2	Nov-09	2111 MW	1,250.3	-1,590.6	1,165.1	-1,394.0	1,077.6	-1,308.6	1,022.8	-1,272.1
3	Dec-09	2111 MW	1,250.3	-1,590.6	1,165.1	-1,394.0	1,077.6	-1,308.6	1,022.8	-1,272.1
4	Jan-10	2211 MW	1,294.4	-1,663.3	1,196.5	-1,451.8	1,101.8	-1,349.5	1,047.7	-1,288.7
5	Feb-10	2402 MW	1,378.6	-1,802.2	1,256.5	-1,562.0	1,147.9	-1,427.6	1,095.2	-1,320.2
6	Mar-10	2402 MW	1,378.6	-1,802.2	1,256.5	-1,562.0	1,147.9	-1,427.6	1,095.2	-1,320.2
7	Apr-10	2515 MW	1,428.4	-1,884.3	1,292.0	-1,627.3	1,175.1	-1,473.8	1,123.3	-1,338.9
8	May-10	2515 MW	1,428.4	-1,884.3	1,292.0	-1,627.3	1,175.1	-1,473.8	1,123.3	-1,338.9
9	Jun-10	2515 MW	1,428.4	-1,884.3	1,292.0	-1,627.3	1,175.1	-1,473.8	1,123.3	-1,338.9
10	Jul-10	2515 MW	1,428.4	-1,884.3	1,292.0	-1,627.3	1,175.1	-1,473.8	1,123.3	-1,338.9
11	Aug-10	3198 MW	1,659.8	-2,245.0	1,518.7	-1,957.0	1,374.4	-1,754.3	1,263.6	-1,586.0
12	Sep-10	3198 MW	1,659.8	-2,245.0	1,518.7	-1,957.0	1,374.4	-1,754.3	1,263.6	-1,586.0
13	Oct-10	3515 MW	1,767.2	-2,412.4	1,623.9	-2,110.0	1,466.9	-1,884.5	1,328.7	-1,700.7
14	Nov-10	3515 MW	1,767.2	-2,412.4	1,623.9	-2,110.0	1,466.9	-1,884.5	1,328.7	-1,700.7
15	Dec-10	3593 MW	1,793.6	-2,453.6	1,649.8	-2,147.7	1,489.6	-1,916.5	1,344.7	-1,728.9
16	Jan-11	3593 MW	1,793.6	-2,453.6	1,649.8	-2,147.7	1,489.6	-1,916.5	1,344.7	-1,728.9
17	Feb-11	3593 MW	1,793.6	-2,453.6	1,649.8	-2,147.7	1,489.6	-1,916.5	1,344.7	-1,728.9
18	Mar-11	3593 MW	1,793.6	-2,453.6	1,649.8	-2,147.7	1,489.6	-1,916.5	1,344.7	-1,728.9
19	Apr-11	3593 MW	1,793.6	-2,453.6	1,649.8	-2,147.7	1,489.6	-1,916.5	1,344.7	-1,728.9
20	May-11	3593 MW	1,793.6	-2,453.6	1,649.8	-2,147.7	1,489.6	-1,916.5	1,344.7	-1,728.9
21	Jun-11	3593 MW	1,793.6	-2,453.6	1,649.8	-2,147.7	1,489.6	-1,916.5	1,344.7	-1,728.9
22	Jul-11	3593 MW	1,793.6	-2,453.6	1,649.8	-2,147.7	1,489.6	-1,916.5	1,344.7	-1,728.9
23	Aug-11	3843 MW	1,895.8	-2,621.8	1,719.0	-2,279.6	1,564.1	-1,942.5	1,385.5	-1,783.2
24	Sep-11	3843 MW	1,895.8	-2,621.8	1,719.0	-2,279.6	1,564.1	-1,942.5	1,385.5	-1,783.2
25	**Rate Period Average:**		**1,604.6**	**-2,156.8**	**1,470.6**	**-1,880.9**	**1,335.8**	**-1,688.3**	**1,229.7**	**-1,544.7**

Exhibit 14: Total Reserve - Old Total Reserve/New Load Input

	Date	Capacity	Total(2 Hr Avg) Inc	Total(2 Hr Avg) Dec	Total(1 Hr) Inc	Total(1 Hr) Dec	Total(45 min) Inc	Total(45 min) Dec	Total(30 min) Inc	Total(30 min) Dec
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
1	Oct-09	2111 MW	1,168.1	-1,489.7	1,043.2	-1,291.0	942.2	-1,156.4	848.3	-971.6
2	Nov-09	2111 MW	1,168.1	-1,489.7	1,043.2	-1,291.0	942.2	-1,156.4	848.3	-971.6
3	Dec-09	2111 MW	1,168.1	-1,489.7	1,043.2	-1,291.0	942.2	-1,156.4	848.3	-971.6
4	Jan-10	2211 MW	1,211.8	-1,563.4	1,077.0	-1,357.1	971.7	-1,211.1	879.9	-1,013.9
5	Feb-10	2402 MW	1,295.1	-1,704.1	1,141.6	-1,483.5	1,028.0	-1,315.4	940.4	-1,094.8
6	Mar-10	2402 MW	1,295.1	-1,704.1	1,141.6	-1,483.5	1,028.0	-1,315.4	940.4	-1,094.8
7	Apr-10	2515 MW	1,344.4	-1,787.4	1,179.8	-1,558.2	1,061.4	-1,377.2	976.2	-1,142.6
8	May-10	2515 MW	1,344.4	-1,787.4	1,179.8	-1,558.2	1,061.4	-1,377.2	976.2	-1,142.6
9	Jun-10	2515 MW	1,344.4	-1,787.4	1,179.8	-1,558.2	1,061.4	-1,377.2	976.2	-1,142.6
10	Jul-10	2515 MW	1,344.4	-1,787.4	1,179.8	-1,558.2	1,061.4	-1,377.2	976.2	-1,142.6
11	Aug-10	3198 MW	1,640.5	-2,226.1	1,475.0	-1,938.8	1,322.2	-1,684.0	1,162.6	-1,412.6
12	Sep-10	3198 MW	1,640.5	-2,226.1	1,475.0	-1,938.8	1,322.2	-1,684.0	1,162.6	-1,412.6
13	Oct-10	3515 MW	1,777.9	-2,429.7	1,611.9	-2,115.5	1,443.3	-1,826.4	1,249.1	-1,537.9
14	Nov-10	3515 MW	1,777.9	-2,429.7	1,611.9	-2,115.5	1,443.3	-1,826.4	1,249.1	-1,537.9
15	Dec-10	3593 MW	1,811.7	-2,479.8	1,645.7	-2,158.9	1,473.0	-1,861.5	1,270.4	-1,568.7
16	Jan-11	3593 MW	1,811.7	-2,479.8	1,645.7	-2,158.9	1,473.0	-1,861.5	1,270.4	-1,568.7
17	Feb-11	3593 MW	1,811.7	-2,479.8	1,645.7	-2,158.9	1,473.0	-1,861.5	1,270.4	-1,568.7
18	Mar-11	3593 MW	1,811.7	-2,479.8	1,645.7	-2,158.9	1,473.0	-1,861.5	1,270.4	-1,568.7
19	Apr-11	3593 MW	1,811.7	-2,479.8	1,645.7	-2,158.9	1,473.0	-1,861.5	1,270.4	-1,568.7
20	May-11	3593 MW	1,811.7	-2,479.8	1,645.7	-2,158.9	1,473.0	-1,861.5	1,270.4	-1,568.7
21	Jun-11	3593 MW	1,811.7	-2,479.8	1,645.7	-2,158.9	1,473.0	-1,861.5	1,270.4	-1,568.7
22	Jul-11	3593 MW	1,811.7	-2,479.8	1,645.7	-2,158.9	1,473.0	-1,861.5	1,270.4	-1,568.7
23	Aug-11	3843 MW	1,989.6	-2,572.6	1,732.7	-2,224.3	1,542.8	-1,983.0	1,368.7	-1,618.2
24	Sep-11	3843 MW	1,989.6	-2,572.6	1,732.7	-2,224.3	1,542.8	-1,983.0	1,368.7	-1,618.2
25	**Rate Period Average:**		**1,583.0**	**-2,120.2**	**1,417.2**	**-1,844.1**	**1,270.9**	**-1,612.4**	**1,122.2**	**-1,349.0**

Exhibit 15: Total Reserve - New Total Reserve/Old Load Input

	Date	Capacity	Total(2 Hr Avg) Inc	Total(2 Hr Avg) Dec	Total(1 Hr) Inc	Total(1 Hr) Dec	Total(45 min) Inc	Total(45 min) Dec	Total(30 min) Inc	Total(30 min) Dec
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
1	Oct-09	2111 MW	1,010.6	-1,179.0	953.9	-1,093.1	912.0	-1,061.1	872.1	-1,022.4
2	Nov-09	2111 MW	1,010.6	-1,179.0	953.9	-1,093.1	912.0	-1,061.1	872.1	-1,022.4
3	Dec-09	2111 MW	1,010.6	-1,179.0	953.9	-1,093.1	912.0	-1,061.1	872.1	-1,022.4
4	Jan-10	2211 MW	1,045.1	-1,222.0	981.1	-1,124.0	935.9	-1,083.5	891.3	-1,039.3
5	Feb-10	2402 MW	1,110.9	-1,304.1	1,032.9	-1,182.9	981.5	-1,126.3	928.0	-1,071.7
6	Mar-10	2402 MW	1,110.9	-1,304.1	1,032.9	-1,182.9	981.5	-1,126.3	928.0	-1,071.7
7	Apr-10	2515 MW	1,149.8	-1,352.6	1,063.6	-1,217.8	1,008.6	-1,151.7	949.7	-1,090.8
8	May-10	2515 MW	1,149.8	-1,352.6	1,063.6	-1,217.8	1,008.6	-1,151.7	949.7	-1,090.8
9	Jun-10	2515 MW	1,149.8	-1,352.6	1,063.6	-1,217.8	1,008.6	-1,151.7	949.7	-1,090.8
10	Jul-10	2515 MW	1,149.8	-1,352.6	1,063.6	-1,217.8	1,008.6	-1,151.7	949.7	-1,090.8
11	Aug-10	3198 MW	1,385.1	-1,668.2	1,248.4	-1,453.6	1,168.6	-1,350.1	1,072.5	-1,233.9
12	Sep-10	3198 MW	1,385.1	-1,668.2	1,248.4	-1,453.6	1,168.6	-1,350.1	1,072.5	-1,233.9
13	Oct-10	3515 MW	1,494.3	-1,814.6	1,334.2	-1,563.1	1,242.9	-1,442.3	1,129.5	-1,300.3
14	Nov-10	3515 MW	1,494.3	-1,814.6	1,334.2	-1,563.1	1,242.9	-1,442.3	1,129.5	-1,300.3
15	Dec-10	3593 MW	1,521.2	-1,850.7	1,355.3	-1,590.0	1,261.2	-1,464.9	1,143.5	-1,316.7
16	Jan-11	3593 MW	1,521.2	-1,850.7	1,355.3	-1,590.0	1,261.2	-1,464.9	1,143.5	-1,316.7
17	Feb-11	3593 MW	1,521.2	-1,850.7	1,355.3	-1,590.0	1,261.2	-1,464.9	1,143.5	-1,316.7
18	Mar-11	3593 MW	1,521.2	-1,850.7	1,355.3	-1,590.0	1,261.2	-1,464.9	1,143.5	-1,316.7
19	Apr-11	3593 MW	1,521.2	-1,850.7	1,355.3	-1,590.0	1,261.2	-1,464.9	1,143.5	-1,316.7
20	May-11	3593 MW	1,521.2	-1,850.7	1,355.3	-1,590.0	1,261.2	-1,464.9	1,143.5	-1,316.7
21	Jun-11	3593 MW	1,521.2	-1,850.7	1,355.3	-1,590.0	1,261.2	-1,464.9	1,143.5	-1,316.7
22	Jul-11	3593 MW	1,521.2	-1,850.7	1,355.3	-1,590.0	1,261.2	-1,464.9	1,143.5	-1,316.7
23	Aug-11	3843 MW	1,603.6	-1,959.3	1,417.9	-1,681.2	1,315.1	-1,536.8	1,190.2	-1,372.5
24	Sep-11	3843 MW	1,603.6	-1,959.3	1,417.9	-1,681.2	1,315.1	-1,536.8	1,190.2	-1,372.5
25	**Rate Period Average:**		**1,334.7**	**-1,602.8**	**1,208.6**	**-1,406.5**	**1,133.8**	**-1,312.7**	**1,045.6**	**-1,206.7**

Exhibit 16: Total Reserve - New Total Reserve/New Load Input

	Date	Capacity	Total(2 Hr Avg) Inc	Total(2 Hr Avg) Dec	Total(1 Hr) Inc	Total(1 Hr) Dec	Total(45 min) Inc	Total(45 min) Dec	Total(30 min) Inc	Total(30 min) Dec
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
1	Oct-09	2111 MW	872.9	-1,104.8	784.1	-953.8	721.5	-862.2	657.5	-762.9
2	Nov-09	2111 MW	872.9	-1,104.8	784.1	-953.8	721.5	-862.2	657.5	-762.9
3	Dec-09	2111 MW	872.9	-1,104.8	784.1	-953.8	721.5	-862.2	657.5	-762.9
4	Jan-10	2211 MW	915.9	-1,157.1	820.0	-996.5	751.7	-901.0	683.5	-793.4
5	Feb-10	2402 MW	997.9	-1,257.0	888.6	-1,078.0	809.2	-975.1	733.2	-851.7
6	Mar-10	2402 MW	997.9	-1,257.0	888.6	-1,078.0	809.2	-975.1	733.2	-851.7
7	Apr-10	2515 MW	1,046.4	-1,316.1	929.2	-1,126.3	843.3	-1,018.9	762.7	-886.2
8	May-10	2515 MW	1,046.4	-1,316.1	929.2	-1,126.3	843.3	-1,018.9	762.7	-886.2
9	Jun-10	2515 MW	1,046.4	-1,316.1	929.2	-1,126.3	843.3	-1,018.9	762.7	-886.2
10	Jul-10	2515 MW	1,046.4	-1,316.1	929.2	-1,126.3	843.3	-1,018.9	762.7	-886.2
11	Aug-10	3198 MW	1,295.3	-1,646.8	1,137.3	-1,401.0	1,034.4	-1,262.3	910.9	-1,094.1
12	Sep-10	3198 MW	1,295.3	-1,646.8	1,137.3	-1,401.0	1,034.4	-1,262.3	910.9	-1,094.1
13	Oct-10	3515 MW	1,410.9	-1,800.3	1,233.8	-1,528.5	1,123.1	-1,375.3	979.8	-1,190.6
14	Nov-10	3515 MW	1,410.9	-1,800.3	1,233.8	-1,528.5	1,123.1	-1,375.3	979.8	-1,190.6
15	Dec-10	3593 MW	1,439.3	-1,838.0	1,257.6	-1,559.9	1,144.9	-1,403.1	996.7	-1,214.3
16	Jan-11	3593 MW	1,439.3	-1,838.0	1,257.6	-1,559.9	1,144.9	-1,403.1	996.7	-1,214.3
17	Feb-11	3593 MW	1,439.3	-1,838.0	1,257.6	-1,559.9	1,144.9	-1,403.1	996.7	-1,214.3
18	Mar-11	3593 MW	1,439.3	-1,838.0	1,257.6	-1,559.9	1,144.9	-1,403.1	996.7	-1,214.3
19	Apr-11	3593 MW	1,439.3	-1,838.0	1,257.6	-1,559.9	1,144.9	-1,403.1	996.7	-1,214.3
20	May-11	3593 MW	1,439.3	-1,838.0	1,257.6	-1,559.9	1,144.9	-1,403.1	996.7	-1,214.3
21	Jun-11	3593 MW	1,439.3	-1,838.0	1,257.6	-1,559.9	1,144.9	-1,403.1	996.7	-1,214.3
22	Jul-11	3593 MW	1,439.3	-1,838.0	1,257.6	-1,559.9	1,144.9	-1,403.1	996.7	-1,214.3
23	Aug-11	3843 MW	1,519.4	-1,941.4	1,328.6	-1,645.4	1,200.5	-1,489.0	1,053.5	-1,279.9
24	Sep-11	3843 MW	1,519.4	-1,941.4	1,328.6	-1,645.4	1,200.5	-1,489.0	1,053.5	-1,279.9
25	**Rate Period Average:**		**1,236.7**	**-1,572.1**	**1,088.6**	**-1,339.5**	**991.0**	**-1,208.0**	**876.5**	**-1,048.9**

Exhibit 17: Wind Reserve - Old Total Reserve/Old Load Input

	Date	Capacity	Total(2 Hr Avg) Inc	Total(2 Hr Avg) Dec	Total(1 Hr) Inc	Total(1 Hr) Dec	Total(45 min) Inc	Total(45 min) Dec	Total(30 min) Inc	Total(30 min) Dec
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
1	Oct-09	2111 MW	605.9	-742.3	474.9	-510.9	377.4	-421.3	293.3	-348.4
2	Nov-09	2111 MW	605.9	-742.3	474.9	-510.9	377.4	-421.3	293.3	-348.4
3	Dec-09	2111 MW	605.9	-742.3	474.9	-510.9	377.4	-421.3	293.3	-348.4
4	Jan-10	2211 MW	647.9	-812.9	503.6	-564.3	406.4	-455.4	318.6	-369.3
5	Feb-10	2402 MW	728.2	-947.7	558.5	-666.1	461.7	-520.5	366.8	-409.1
6	Mar-10	2402 MW	728.2	-947.7	558.5	-666.1	461.7	-520.5	366.8	-409.1
7	Apr-10	2515 MW	775.7	-1,027.5	591.0	-726.3	494.5	-559.0	395.4	-432.6
8	May-10	2515 MW	775.7	-1,027.5	591.0	-726.3	494.5	-559.0	395.4	-432.6
9	Jun-10	2515 MW	775.7	-1,027.5	591.0	-726.3	494.5	-559.0	395.4	-432.6
10	Jul-10	2515 MW	775.7	-1,027.5	591.0	-726.3	494.5	-559.0	395.4	-432.6
11	Aug-10	3198 MW	1,013.6	-1,447.9	805.2	-1,111.3	674.5	-855.1	558.2	-648.5
12	Sep-10	3198 MW	1,013.6	-1,447.9	805.2	-1,111.3	674.5	-855.1	558.2	-648.5
13	Oct-10	3515 MW	1,124.0	-1,643.0	904.6	-1,290.0	758.0	-992.6	633.8	-748.6
14	Nov-10	3515 MW	1,124.0	-1,643.0	904.6	-1,290.0	758.0	-992.6	633.8	-748.6
15	Dec-10	3593 MW	1,151.2	-1,691.0	929.0	-1,334.0	778.6	-1,026.4	652.4	-773.3
16	Jan-11	3593 MW	1,151.2	-1,691.0	929.0	-1,334.0	778.6	-1,026.4	652.4	-773.3
17	Feb-11	3593 MW	1,151.2	-1,691.0	929.0	-1,334.0	778.6	-1,026.4	652.4	-773.3
18	Mar-11	3593 MW	1,151.2	-1,691.0	929.0	-1,334.0	778.6	-1,026.4	652.4	-773.3
19	Apr-11	3593 MW	1,151.2	-1,691.0	929.0	-1,334.0	778.6	-1,026.4	652.4	-773.3
20	May-11	3593 MW	1,151.2	-1,691.0	929.0	-1,334.0	778.6	-1,026.4	652.4	-773.3
21	Jun-11	3593 MW	1,151.2	-1,691.0	929.0	-1,334.0	778.6	-1,026.4	652.4	-773.3
22	Jul-11	3593 MW	1,151.2	-1,691.0	929.0	-1,334.0	778.6	-1,026.4	652.4	-773.3
23	Aug-11	3843 MW	1,242.5	-1,845.9	1,008.7	-1,447.9	854.0	-1,099.4	695.7	-849.5
24	Sep-11	3843 MW	1,242.5	-1,845.9	1,008.7	-1,447.9	854.0	-1,099.4	695.7	-849.5
25	**Rate Period Average:**		**958.1**	**-1,351.9**	**761.6**	**-1,029.4**	**635.1**	**-795.9**	**521.2**	**-610.1**

Exhibit 18: Wind Reserve - Old Total Reserve/New Load Input

			Total(2 Hr Avg)		Total(1 Hr)		Total(45 min)		Total(30 min)	
	Date	Capacity	Inc	Dec	Inc	Dec	Inc	Dec	Inc	Dec
	A	B	C	D	E	F	G	H	I	J
1	Oct-09	2111 MW	749.6	-1,121.1	618.5	-893.9	519.1	-738.1	426.9	-553.7
2	Nov-09	2111 MW	749.6	-1,121.1	618.5	-893.9	519.1	-738.1	426.9	-553.7
3	Dec-09	2111 MW	749.6	-1,121.1	618.5	-893.9	519.1	-738.1	426.9	-553.7
4	Jan-10	2211 MW	802.2	-1,199.1	661.7	-964.5	556.9	-796.3	458.7	-594.2
5	Feb-10	2402 MW	902.8	-1,348.3	744.3	-1,099.5	629.1	-907.4	519.3	0.0
6	Mar-10	2402 MW	902.8	-1,348.3	744.3	-1,099.5	629.1	-907.4	519.3	-671.4
7	Apr-10	2515 MW	962.3	-1,436.5	793.2	-1,179.3	671.7	-973.2	555.2	-717.1
8	May-10	2515 MW	962.3	-1,436.5	793.2	-1,179.3	671.7	-973.2	555.2	-717.1
9	Jun-10	2515 MW	962.3	-1,436.5	793.2	-1,179.3	671.7	-973.2	555.2	-717.1
10	Jul-10	2515 MW	962.3	-1,436.5	793.2	-1,179.3	671.7	-973.2	555.2	-717.1
11	Aug-10	3198 MW	1,297.3	-1,902.0	1,114.7	-1,587.8	952.3	-1,305.3	765.0	-1,002.3
12	Sep-10	3198 MW	1,297.3	-1,902.0	1,114.7	-1,587.8	952.3	-1,305.3	765.0	-1,002.3
13	Oct-10	3515 MW	1,452.8	-2,118.0	1,264.0	-1,777.4	1,082.5	-1,459.5	862.4	-1,134.8
14	Nov-10	3515 MW	1,452.8	-2,118.0	1,264.0	-1,777.4	1,082.5	-1,459.5	862.4	-1,134.8
15	Dec-10	3593 MW	1,491.0	-2,171.2	1,300.7	-1,824.0	1,114.5	-1,497.4	886.4	-1,167.3
16	Jan-11	3593 MW	1,491.0	-2,171.2	1,300.7	-1,824.0	1,114.5	-1,497.4	886.4	-1,167.3
17	Feb-11	3593 MW	1,491.0	-2,171.2	1,300.7	-1,824.0	1,114.5	-1,497.4	886.4	-1,167.3
18	Mar-11	3593 MW	1,491.0	-2,171.2	1,300.7	-1,824.0	1,114.5	-1,497.4	886.4	-1,167.3
19	Apr-11	3593 MW	1,491.0	-2,171.2	1,300.7	-1,824.0	1,114.5	-1,497.4	886.4	-1,167.3
20	May-11	3593 MW	1,491.0	-2,171.2	1,300.7	-1,824.0	1,114.5	-1,497.4	886.4	-1,167.3
21	Jun-11	3593 MW	1,491.0	-2,171.2	1,300.7	-1,824.0	1,114.5	-1,497.4	886.4	-1,167.3
22	Jul-11	3593 MW	1,491.0	-2,171.2	1,300.7	-1,824.0	1,114.5	-1,497.4	886.4	-1,167.3
23	Aug-11	3843 MW	1,665.1	-2,266.4	1,393.3	-1,890.1	1,187.6	-1,620.9	972.3	-1,222.1
24	Sep-11	3843 MW	1,665.1	-2,266.4	1,393.3	-1,890.1	1,187.6	-1,620.9	972.3	-1,222.1
25	**Rate Period Average:**		**1,227.7**	**-1,789.5**	**1,047.0**	**-1,486.0**	**892.5**	**-1,227.9**	**720.4**	**-938.5**

Exhibit 19: Wind Reserve - New Total Reserve/Old Load Input

	Date	Capacity	Total(2 Hr Avg) Inc	Total(2 Hr Avg) Dec	Total(1 Hr) Inc	Total(1 Hr) Dec	Total(45 min) Inc	Total(45 min) Dec	Total(30 min) Inc	Total(30 min) Dec
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
1	Oct-09	2111 MW	492.3	-551.8	391.4	-403.2	322.6	-345.0	252.4	-282.9
2	Nov-09	2111 MW	492.3	-551.8	391.4	-403.2	322.6	-345.0	252.4	-282.9
3	Dec-09	2111 MW	492.3	-551.8	391.4	-403.2	322.6	-345.0	252.4	-282.9
4	Jan-10	2211 MW	525.6	-597.9	415.6	-438.4	348.7	-368.4	273.3	-301.0
5	Feb-10	2402 MW	589.0	-686.0	461.7	-505.8	398.6	-413.3	313.1	-335.5
6	Mar-10	2402 MW	589.0	-686.0	461.7	-505.8	398.6	-413.3	313.1	-335.5
7	Apr-10	2515 MW	626.5	-738.2	489.0	-545.6	428.1	-439.8	336.7	-355.9
8	May-10	2515 MW	626.5	-738.2	489.0	-545.6	428.1	-439.8	336.7	-355.9
9	Jun-10	2515 MW	626.5	-738.2	489.0	-545.6	428.1	-439.8	336.7	-355.9
10	Jul-10	2515 MW	626.5	-738.2	489.0	-545.6	428.1	-439.8	336.7	-355.9
11	Aug-10	3198 MW	850.6	-1,079.8	663.9	-826.1	576.3	-659.4	476.6	-504.4
12	Sep-10	3198 MW	850.6	-1,079.8	663.9	-826.1	576.3	-659.4	476.6	-504.4
13	Oct-10	3515 MW	954.7	-1,238.4	745.1	-956.3	645.1	-761.4	541.5	-573.3
14	Nov-10	3515 MW	954.7	-1,238.4	745.1	-956.3	645.1	-761.4	541.5	-573.3
15	Dec-10	3593 MW	980.3	-1,277.4	765.0	-988.4	662.0	-786.5	557.5	-590.2
16	Jan-11	3593 MW	980.3	-1,277.4	765.0	-988.4	662.0	-786.5	557.5	-590.2
17	Feb-11	3593 MW	980.3	-1,277.4	765.0	-988.4	662.0	-786.5	557.5	-590.2
18	Mar-11	3593 MW	980.3	-1,277.4	765.0	-988.4	662.0	-786.5	557.5	-590.2
19	Apr-11	3593 MW	980.3	-1,277.4	765.0	-988.4	662.0	-786.5	557.5	-590.2
20	May-11	3593 MW	980.3	-1,277.4	765.0	-988.4	662.0	-786.5	557.5	-590.2
21	Jun-11	3593 MW	980.3	-1,277.4	765.0	-988.4	662.0	-786.5	557.5	-590.2
22	Jul-11	3593 MW	980.3	-1,277.4	765.0	-988.4	662.0	-786.5	557.5	-590.2
23	Aug-11	3843 MW	1,054.7	-1,380.5	833.9	-1,068.0	720.6	-873.3	600.5	-655.4
24	Sep-11	3843 MW	1,054.7	-1,380.5	833.9	-1,068.0	720.6	-873.3	600.5	-655.4
25	**Rate Period Average:**		**802.0**	**-1,008.1**	**628.1**	**-768.7**	**541.9**	**-619.5**	**445.9**	**-476.3**

Exhibit 20: Wind Reserve - New Total Reserve/New Load Input

	Date	Capacity	Total(2 Hr Avg) Inc	Total(2 Hr Avg) Dec	Total(1 Hr) Inc	Total(1 Hr) Dec	Total(45 min) Inc	Total(45 min) Dec	Total(30 min) Inc	Total(30 min) Dec
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
1	Oct-09	2111 MW	560.0	-835.4	465.1	-663.6	398.5	-554.0	332.0	-441.1
2	Nov-09	2111 MW	560.0	-835.4	465.1	-663.6	398.5	-554.0	332.0	-441.1
3	Dec-09	2111 MW	560.0	-835.4	465.1	-663.6	398.5	-554.0	332.0	-441.1
4	Jan-10	2211 MW	607.0	-891.1	505.0	-710.7	432.5	-595.8	357.4	-471.0
5	Feb-10	2402 MW	696.8	-997.7	581.2	-800.6	497.3	-675.7	405.9	-528.0
6	Mar-10	2402 MW	696.8	-997.7	581.2	-800.6	497.3	-675.7	405.9	-528.0
7	Apr-10	2515 MW	749.9	-1,060.7	626.2	-853.8	535.7	-722.9	434.6	-561.8
8	May-10	2515 MW	749.9	-1,060.7	626.2	-853.8	535.7	-722.9	434.6	-561.8
9	Jun-10	2515 MW	749.9	-1,060.7	626.2	-853.8	535.7	-722.9	434.6	-561.8
10	Jul-10	2515 MW	749.9	-1,060.7	626.2	-853.8	535.7	-722.9	434.6	-561.8
11	Aug-10	3198 MW	1,025.8	-1,409.1	858.0	-1,147.4	744.7	-981.6	599.8	-781.0
12	Sep-10	3198 MW	1,025.8	-1,409.1	858.0	-1,147.4	744.7	-981.6	599.8	-781.0
13	Oct-10	3515 MW	1,153.9	-1,570.8	965.6	-1,283.7	841.7	-1,101.6	676.5	-882.7
14	Nov-10	3515 MW	1,153.9	-1,570.8	965.6	-1,283.7	841.7	-1,101.6	676.5	-882.7
15	Dec-10	3593 MW	1,185.4	-1,610.6	992.1	-1,317.2	865.6	-1,131.2	695.4	-907.7
16	Jan-11	3593 MW	1,185.4	-1,610.6	992.1	-1,317.2	865.6	-1,131.2	695.4	-907.7
17	Feb-11	3593 MW	1,185.4	-1,610.6	992.1	-1,317.2	865.6	-1,131.2	695.4	-907.7
18	Mar-11	3593 MW	1,185.4	-1,610.6	992.1	-1,317.2	865.6	-1,131.2	695.4	-907.7
19	Apr-11	3593 MW	1,185.4	-1,610.6	992.1	-1,317.2	865.6	-1,131.2	695.4	-907.7
20	May-11	3593 MW	1,185.4	-1,610.6	992.1	-1,317.2	865.6	-1,131.2	695.4	-907.7
21	Jun-11	3593 MW	1,185.4	-1,610.6	992.1	-1,317.2	865.6	-1,131.2	695.4	-907.7
22	Jul-11	3593 MW	1,185.4	-1,610.6	992.1	-1,317.2	865.6	-1,131.2	695.4	-907.7
23	Aug-11	3843 MW	1,269.2	-1,712.5	1,066.4	-1,398.7	923.1	-1,218.8	746.9	-971.9
24	Sep-11	3843 MW	1,269.2	-1,712.5	1,066.4	-1,398.7	923.1	-1,218.8	746.9	-971.9
25	**Rate Period Average:**		**960.9**	**-1,329.4**	**803.5**	**-1,079.8**	**696.2**	**-923.1**	**563.0**	**-734.6**

Exhibit 21: Load Reserve - Old Total Reserve/Old Load Input

	Date	Capacity	Total(2 Hr Avg) Inc	Total(2 Hr Avg) Dec	Total(1 Hr) Inc	Total(1 Hr) Dec	Total(45 min) Inc	Total(45 min) Dec	Total(30 min) Inc	Total(30 min) Dec
	A	B	C	D	E	F	G	H	I	J
1	Oct-09	2111 MW	644.4	-848.3	690.3	-883.1	700.3	-887.2	729.5	-923.7
2	Nov-09	2111 MW	644.4	-848.3	690.3	-883.1	700.3	-887.2	729.5	-923.7
3	Dec-09	2111 MW	644.4	-848.3	690.3	-883.1	700.3	-887.2	729.5	-923.7
4	Jan-10	2211 MW	646.5	-850.4	692.9	-887.5	695.4	-894.1	729.1	-919.4
5	Feb-10	2402 MW	650.4	-854.5	698.0	-895.9	686.2	-907.1	728.3	-911.2
6	Mar-10	2402 MW	650.4	-854.5	698.0	-895.9	686.2	-907.1	728.3	-911.2
7	Apr-10	2515 MW	652.8	-856.8	701.0	-900.9	680.7	-914.8	727.9	-906.3
8	May-10	2515 MW	652.8	-856.8	701.0	-900.9	680.7	-914.8	727.9	-906.3
9	Jun-10	2515 MW	652.8	-856.8	701.0	-900.9	680.7	-914.8	727.9	-906.3
10	Jul-10	2515 MW	652.8	-856.8	701.0	-900.9	680.7	-914.8	727.9	-906.3
11	Aug-10	3198 MW	646.2	-797.1	713.6	-845.7	699.9	-899.2	705.3	-937.6
12	Sep-10	3198 MW	646.2	-797.1	713.6	-845.7	699.9	-899.2	705.3	-937.6
13	Oct-10	3515 MW	643.2	-769.4	719.4	-820.0	708.8	-891.9	694.8	-952.1
14	Nov-10	3515 MW	643.2	-769.4	719.4	-820.0	708.8	-891.9	694.8	-952.1
15	Dec-10	3593 MW	642.5	-762.6	720.8	-813.7	711.0	-890.1	692.3	-955.7
16	Jan-11	3593 MW	642.5	-762.6	720.8	-813.7	711.0	-890.1	692.3	-955.7
17	Feb-11	3593 MW	642.5	-762.6	720.8	-813.7	711.0	-890.1	692.3	-955.7
18	Mar-11	3593 MW	642.5	-762.6	720.8	-813.7	711.0	-890.1	692.3	-955.7
19	Apr-11	3593 MW	642.5	-762.6	720.8	-813.7	711.0	-890.1	692.3	-955.7
20	May-11	3593 MW	642.5	-762.6	720.8	-813.7	711.0	-890.1	692.3	-955.7
21	Jun-11	3593 MW	642.5	-762.6	720.8	-813.7	711.0	-890.1	692.3	-955.7
22	Jul-11	3593 MW	642.5	-762.6	720.8	-813.7	711.0	-890.1	692.3	-955.7
23	Aug-11	3843 MW	653.3	-776.0	710.3	-831.7	710.1	-843.0	689.9	-933.8
24	Sep-11	3843 MW	653.3	-776.0	710.3	-831.7	710.1	-843.0	689.9	-933.8
25	**Rate Period Average:**		**646.5**	**-804.9**	**709.0**	**-851.5**	**700.7**	**-892.4**	**708.5**	**-934.6**

Exhibit 22: Load Reserve - Old Total Reserve/New Load Input

			Total(2 Hr Avg)		Total(1 Hr)		Total(45 min)		Total(30 min)	
	Date	Capacity	Inc	Dec	Inc	Dec	Inc	Dec	Inc	Dec
	A	B	C	D	E	F	G	H	I	J
1	Oct-09	2111 MW	418.6	-368.7	424.7	-397.1	423.1	-418.4	421.4	-417.8
2	Nov-09	2111 MW	418.6	-368.7	424.7	-397.1	423.1	-418.4	421.4	-417.8
3	Dec-09	2111 MW	418.6	-368.7	424.7	-397.1	423.1	-418.4	421.4	-417.8
4	Jan-10	2211 MW	409.5	-364.2	415.3	-392.6	414.8	-414.8	421.3	-419.8
5	Feb-10	2402 MW	392.3	-355.8	397.3	-384.0	399.0	-408.0	421.1	-423.4
6	Mar-10	2402 MW	392.3	-355.8	397.3	-384.0	399.0	-408.0	421.1	-423.4
7	Apr-10	2515 MW	382.1	-350.9	386.6	-378.9	389.6	-404.0	421.0	-425.5
8	May-10	2515 MW	382.1	-350.9	386.6	-378.9	389.6	-404.0	421.0	-425.5
9	Jun-10	2515 MW	382.1	-350.9	386.6	-378.9	389.6	-404.0	421.0	-425.5
10	Jul-10	2515 MW	382.1	-350.9	386.6	-378.9	389.6	-404.0	421.0	-425.5
11	Aug-10	3198 MW	343.2	-324.1	360.2	-351.0	369.9	-378.7	397.5	-410.2
12	Sep-10	3198 MW	343.2	-324.1	360.2	-351.0	369.9	-378.7	397.5	-410.2
13	Oct-10	3515 MW	325.1	-311.6	348.0	-338.1	360.8	-366.9	386.6	-403.1
14	Nov-10	3515 MW	325.1	-311.6	348.0	-338.1	360.8	-366.9	386.6	-403.1
15	Dec-10	3593 MW	320.6	-308.6	345.0	-334.9	358.5	-364.1	384.0	-401.4
16	Jan-11	3593 MW	320.6	-308.6	345.0	-334.9	358.5	-364.1	384.0	-401.4
17	Feb-11	3593 MW	320.6	-308.6	345.0	-334.9	358.5	-364.1	384.0	-401.4
18	Mar-11	3593 MW	320.6	-308.6	345.0	-334.9	358.5	-364.1	384.0	-401.4
19	Apr-11	3593 MW	320.6	-308.6	345.0	-334.9	358.5	-364.1	384.0	-401.4
20	May-11	3593 MW	320.6	-308.6	345.0	-334.9	358.5	-364.1	384.0	-401.4
21	Jun-11	3593 MW	320.6	-308.6	345.0	-334.9	358.5	-364.1	384.0	-401.4
22	Jul-11	3593 MW	320.6	-308.6	345.0	-334.9	358.5	-364.1	384.0	-401.4
23	Aug-11	3843 MW	324.5	-306.2	339.4	-334.2	355.2	-362.1	396.4	-396.1
24	Sep-11	3843 MW	324.5	-306.2	339.4	-334.2	355.2	-362.1	396.4	-396.1
25	**Rate Period Average:**		**355.4**	**-330.7**	**370.2**	**-358.1**	**378.4**	**-384.6**	**401.9**	**-410.5**

Exhibit 23: Load Reserve - New Total Reserve/Old Load Input

	Date	Capacity	Total(2 Hr Avg) Inc	Total(2 Hr Avg) Dec	Total(1 Hr) Inc	Total(1 Hr) Dec	Total(45 min) Inc	Total(45 min) Dec	Total(30 min) Inc	Total(30 min) Dec
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
1	Oct-09	2111 MW	518.3	-627.2	562.5	-689.9	589.4	-716.1	619.7	-739.4
2	Nov-09	2111 MW	518.3	-627.2	562.5	-689.9	589.4	-716.1	619.7	-739.4
3	Dec-09	2111 MW	518.3	-627.2	562.5	-689.9	589.4	-716.1	619.7	-739.4
4	Jan-10	2211 MW	519.5	-624.1	565.5	-685.6	587.2	-715.1	618.1	-738.3
5	Feb-10	2402 MW	521.9	-618	571.2	-677.2	583	-713.1	614.9	-736.2
6	Mar-10	2402 MW	521.9	-618	571.2	-677.2	583	-713.1	614.9	-736.2
7	Apr-10	2515 MW	523.3	-614.5	574.5	-672.2	580.5	-711.9	613	-734.9
8	May-10	2515 MW	523.3	-614.5	574.5	-672.2	580.5	-711.9	613	-734.9
9	Jun-10	2515 MW	523.3	-614.5	574.5	-672.2	580.5	-711.9	613	-734.9
10	Jul-10	2515 MW	523.3	-614.5	574.5	-672.2	580.5	-711.9	613	-734.9
11	Aug-10	3198 MW	534.5	-588.3	584.5	-627.5	592.3	-690.7	595.9	-729.6
12	Sep-10	3198 MW	534.5	-588.3	584.5	-627.5	592.3	-690.7	595.9	-729.6
13	Oct-10	3515 MW	539.7	-576.2	589.1	-606.8	597.8	-680.9	588	-727.1
14	Nov-10	3515 MW	539.7	-576.2	589.1	-606.8	597.8	-680.9	588	-727.1
15	Dec-10	3593 MW	540.9	-573.2	590.3	-601.6	599.2	-678.4	586	-726.5
16	Jan-11	3593 MW	540.9	-573.2	590.3	-601.6	599.2	-678.4	586	-726.5
17	Feb-11	3593 MW	540.9	-573.2	590.3	-601.6	599.2	-678.4	586	-726.5
18	Mar-11	3593 MW	540.9	-573.2	590.3	-601.6	599.2	-678.4	586	-726.5
19	Apr-11	3593 MW	540.9	-573.2	590.3	-601.6	599.2	-678.4	586	-726.5
20	May-11	3593 MW	540.9	-573.2	590.3	-601.6	599.2	-678.4	586	-726.5
21	Jun-11	3593 MW	540.9	-573.2	590.3	-601.6	599.2	-678.4	586	-726.5
22	Jul-11	3593 MW	540.9	-573.2	590.3	-601.6	599.2	-678.4	586	-726.5
23	Aug-11	3843 MW	549	-578.8	584	-613.1	594.5	-663.6	589.6	-717.1
24	Sep-11	3843 MW	549	-578.8	584	-613.1	594.5	-663.6	589.6	-717.1
25	**Rate Period Average:**		**532.7**	**-594.7**	**580.4**	**-637.8**	**591.9**	**-693.1**	**599.8**	**-730.3**

Exhibit 24: Load Reserve - New Total Reserve/New Load Input

	Date	Capacity	Total(2 Hr Avg) Inc	Total(2 Hr Avg) Dec	Total(1 Hr) Inc	Total(1 Hr) Dec	Total(45 min) Inc	Total(45 min) Dec	Total(30 min) Inc	Total(30 min) Dec
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
1	10/1/2009	2111 MW	313.0	-269.4	319.0	-290.2	323.0	-308.3	325.5	-321.8
2	11/1/2009	2111 MW	313.0	-269.4	319.0	-290.2	323.0	-308.3	325.5	-321.8
3	12/1/2009	2111 MW	313.0	-269.4	319.0	-290.2	323.0	-308.3	325.5	-321.8
4	1/1/2010	2211 MW	308.9	-266.0	315.0	-285.8	319.2	-305.2	326.1	-322.4
5	2/1/2010	2402 MW	301.1	-259.3	307.4	-277.4	311.9	-299.4	327.3	-323.7
6	3/1/2010	2402 MW	301.1	-259.3	307.4	-277.4	311.9	-299.4	327.3	-323.7
7	4/1/2010	2515 MW	296.5	-255.4	303.0	-272.5	307.6	-296.0	328.0	-324.5
8	5/1/2010	2515 MW	296.5	-255.4	303.0	-272.5	307.6	-296.0	328.0	-324.5
9	6/1/2010	2515 MW	296.5	-255.4	303.0	-272.5	307.6	-296.0	328.0	-324.5
10	7/1/2010	2515 MW	296.5	-255.4	303.0	-272.5	307.6	-296.0	328.0	-324.5
11	8/1/2010	3198 MW	269.5	-237.7	279.2	-253.6	289.7	-280.8	311.1	-313.1
12	9/1/2010	3198 MW	269.5	-237.7	279.2	-253.6	289.7	-280.8	311.1	-313.1
13	10/1/2010	3515 MW	257.0	-229.5	268.2	-244.9	281.4	-273.7	303.3	-307.9
14	11/1/2010	3515 MW	257.0	-229.5	268.2	-244.9	281.4	-273.7	303.3	-307.9
15	12/1/2010	3593 MW	253.9	-227.4	265.5	-242.7	279.3	-272.0	301.3	-306.6
16	1/1/2011	3593 MW	253.9	-227.4	265.5	-242.7	279.3	-272.0	301.3	-306.6
17	2/1/2011	3593 MW	253.9	-227.4	265.5	-242.7	279.3	-272.0	301.3	-306.6
18	3/1/2011	3593 MW	253.9	-227.4	265.5	-242.7	279.3	-272.0	301.3	-306.6
19	4/1/2011	3593 MW	253.9	-227.4	265.5	-242.7	279.3	-272.0	301.3	-306.6
20	5/1/2011	3593 MW	253.9	-227.4	265.5	-242.7	279.3	-272.0	301.3	-306.6
21	6/1/2011	3593 MW	253.9	-227.4	265.5	-242.7	279.3	-272.0	301.3	-306.6
22	7/1/2011	3593 MW	253.9	-227.4	265.5	-242.7	279.3	-272.0	301.3	-306.6
23	8/1/2011	3843 MW	250.2	-228.8	262.3	-246.6	277.4	-270.2	306.6	-308.0
24	9/1/2011	3843 MW	250.2	-228.8	262.3	-246.6	277.4	-270.2	306.6	-308.0
25	**Rate Period Average:**		**275.9**	**-242.7**	**285.1**	**-259.7**	**294.8**	**-284.9**	**313.4**	**-314.3**