

# **2012 BPA Rate Case Customer Workshop**

**Generation Inputs/Wind Balancing  
Service  
May 12, 2010**



# Agenda

1. Parking lot issues for wind/generation input topics
2. DSO 216
3. Persistent Deviation
4. Imbalance Services
5. Discuss recent experience with wind scheduling accuracy
6. Provisional Balancing Service
7. Wrap up and next steps



## About Today's Discussion

- Understand the existing tools for maintaining system reliability and their inter-relationships.
- The issues discussed today do not reflect BPA commitment to adopt any particular proposal or position. The materials are very much a work in progress.
- Today's discussion is preliminary and pre-decisional.
- We look forward to working together to better understand the issues that will help shape the development of the Initial Proposal.



# Parking Lot Issues



# Parking Lot Issues

WIND/GENERATION INPUTS PARKING LOT TOPICS		
1	Persistent Deviation Penalty ▪Relative to DSO 216	See Workshop Schedule
2	DSO 216 – Experience to date	See Workshop Schedule
3	Generation Imbalance relationship to within-hour balancing	See Workshop Schedule
4	Incentive for scheduling accuracy	To be scheduled
5	Use of 120-hour peaking capacity for costing methodology vs. use of instantaneous capacity for reserve requirement calculation	See Workshop Schedule
6	Review of BPA’s five services/protocols related to wind integration for duplication and consistency, esp. with regard to Persistent Deviation Penalty	See Workshop Schedule
7	Explore whether, and to what extent, BPA can set aside wind reserves on an incremental and flexible basis over the rate period (to enable incentive-based rate design)	To be scheduled
8	Tiered wind integration rate structure based on whether customers are committed to scheduling on a ½ hour basis	To be scheduled
9	Modify BPA’s intra-hour scheduling policy to allow for incremental changes in wind schedules as well as the decremental changes currently allowed	Wind Integration Team (WIT) Quarterly Review



## Parking Lot Issues (continued)

WIND/GENERATION INPUTS PARKING LOT TOPICS		
10	Formula rate for wind	To be scheduled
11	Charge imbalance portion of the wind integration rate on a basis that reflects schedule accuracy – i.e., proportionate to the schedule imbalances.	To be scheduled
12	Scaling methodology – revisit	See Workshop Schedule
13	Timeline for decisions re. assumptions	See Workshop Schedule
14	<ul style="list-style-type: none"> <li>▪ Timing for:                             <ul style="list-style-type: none"> <li>-Self-supply</li> <li>-Within-hour scheduling</li> </ul> </li> </ul>	See Workshop Schedule
15	Wind experience to date	See Workshop Schedule
16	Periodic presentations from the WIT to provide updates on WIT projects over the rate period	To be scheduled
17	Marginal pricing for capacity sold as ancillary and control area services	To be scheduled
18	Inclusion of Energy Shift costs in the variable costs component of Gen Input costs.	



# DSO 216



## DSO 216

- DSO 216 is an essential tool that keeps the balancing reserve deployed within bounds. It gives BPA the ability to limit output of Variable Energy Resources (VERs) during overgeneration conditions and to curtail the tags from VERs during undergeneration conditions.
- When in-hour balancing reserves deployed reach 85% of the amount set aside for 30 seconds, an alarm is generated.
- When in-hour balancing reserves deployed reach 90% of the amount set aside, wind is limited to its schedule plus reserve allocation for overgeneration conditions, and wind etags are curtailed to the actual amount being generated plus reserve allocation for undergeneration conditions.



## DSO 216 (continued)

- When in-hour balancing reserves deployed reach 90% of the amount set aside, wind is limited to its schedule plus reserve allocation for overgeneration conditions, and wind etags are curtailed to the actual amount being generated plus reserve allocation for undergeneration conditions.
  - The limit must be exceeded for 30 seconds prior to action being taken.
  - The dispatcher has four minutes following the action to suspend the action from occurring or to cause the action to take place immediately.
- If, following a 90% limitation/curtailment, the reserve deployed reached 100% of the amount set aside, the wind is limited or tags curtailed just as is done for 90%, however, there is no reserve allocation added to the schedule or actual.



## DSO 216 (continued)

- BPA will continue to use DSO 216 in order to have the ability to continue to integrate VERs without risking the integrity of the BPA transmission system.
- Even once other initiatives, such as intra-hour scheduling and self-supply, are functional, BPA does not plan on suspending DSO 216, because it is the ultimate backstop and even with these other initiatives in place, wind schedules may miss the mark once in a while.
  - If the intra-hourly scheduling market is not active for a couple of hours, issues could arise in the second half of an hour for those depending on it.
  - If dynamic scheduling is limited due to voltage/reactive constraints, balancing reserve from other resources may not be available, causing BPA to deploy an inordinate amount of reserve if the DSO 216 backstop were not in place.



# Summary of DSO 216 events through March 31, 2010

	October	November	December	January	February	March	Total	Total
<b>Limit (DC) Events</b>	Act	Act	Act	Act	Act	Act	Act	Estimate Provided Summer 2009
Level 1	2	2	1	1	0	4	10	24
MW per L1 Event	379	305	534	214	0	194	289	272
L1 MW per month	758	610	534	214	0	776	2892	6000
Average Number of Sources	12	9	13	13	0	7	11	
Average MW by Source	33	36	41	16	0	28	32	
<b>Curtailment (INC) Events</b>	Act	Act	Act	Act	Act	Act	Act	Act
Level 1	2	5	2	1	1	2	13	22
MW per L1 Event	151	327	233	329	179	550	308	240
L1 MW per month	302	1633	466	329	179	1100	4009	5300
Average Number of Sources	5	12	9	13	11	14	10	
Average Number of PODs	6	12	8	10	6	11	9	
Average MW by Source	30	27	26	25	16	50	29	
<b>Installed Capacity (as of the end of each month)</b>	October	November	December	January	February	March	Median	Median
	2284	2517	2680	2780	2780	2780	2680	



# Total Reserve Requirement

- Current total reserve requirement is based on having enough balancing reserve to meet system conditions 99.5% of the time.
- Numbers are based on 5380 MW installed capacity for 2012 and 6530 MW installed wind capacity in 2013 with the 30 minute persistence model for scheduling.
- Reducing the percentage of time that needs to be met with in-hour balancing reserve to different levels would reduce the reserve needed, but would increase the number of times BPA would need to limit wind output or curtail wind schedules.
- A couple of very rough estimates based on preliminary data:

Percentage of time covered (percentile used for calc)	2012		2013	
	Dec Reserve	Inc Reserve	Dec Reserve	Inc Reserve
99.5	-1410	1114	-1622	1433
99	-1217	974	-1389	1242
95	-735	663	-850	855



## DSO 216 – Multiple Enforcement Parameters?

- Assuming that self-provision is an option during the rate period, customers that choose to self-provide will be required to commit to self-provision for the entire rate period.
- If a customer fails self-supply part way through the rate period, some mechanism will be needed to account for the unplanned balancing service requirement. Such a mechanism could be provisional balancing reserve, which means that customer would be curtailed or limited prior to taking action on full-service customers.
  - Perhaps take action on the provisional balancing reserve customers when reserve deployed reaches 75%.
  - Other option – when provisional balancing reserve customers' reserve exceeds the reserve capacity they are limited or curtailed.
- When a customer is self-supplying, DSO 216 could be applied on the customer prior to taking action on full service customers.
  - If self-supplier is out of its reserve band and total reserve deployed reaches a threshold (80 or 85%), the self-supplier could be limited or curtailed prior to the remainder of the wind fleet being limited or curtailed due to a 90% exceedance.
- For full service customers, the DSO mechanism will not have major changes from the current operations.



# Persistent Deviation



# Outline for Discussing Persistent Deviation Issues

- Background
- March Imbalance accumulation
- Goals of PD
- Rate case decisions on PD
- Assessment of bands defined in rate case
- Description of patterns of PD
- Key points



# Energy Imbalance and Generation Imbalance Definitions and Intent

- Energy Imbalance Service (EI):
  - is an Ancillary Service provided to loads in the BPA Control Area. This service is taken when there is a difference between scheduled and actual energy delivered to a load in the BPA CA during a schedule hour. The rates for this service use deviation bands that establish the settlement of deviations as a function of the amount of the hourly deviations. This rate is also subject to Persistent Deviation, BPA Incremental Costs and Spill Conditions provisions.
- Generation Imbalance Service (GI):
  - is a Control Area Service provided to generating resources in the BPA Control Area if GI is provided for in an interconnection agreement or other arrangement. GI is taken when there is a difference between scheduled and actual energy delivered from generating resources in the BPA Control Area during a schedule hour. This rate is also subject to deviation bands, Persistent Deviation, BPA Incremental Costs and Spill Conditions provisions.



## Energy Imbalance and Generation Imbalance Definitions and Intent (Continued)

- The intent of both of these rates is to encourage accurate scheduling. Financial settlement for imbalance energy should provide effective price signals that do not result in compromising system reliability. These services are not intended to provide a market arbitrage mechanism for loads or generators, and there should not be a significant difference between energy taken or delivered to the system over time.



## Persistent Deviation (PD) Under EI and GI

- Persistent Deviation is a penalty charged under both EI and GI. When PD is charged, no credit is given for overgeneration or a penalty rate is applied for energy taken for the hours where TS determines there is a PD.
- Essentially, there two conditions that will trigger a PD determination for EI and GI:
  1. Negative or positive deviation in the same direction for four or more consecutive hours, if the deviation exceeds both: (i) 15% of the schedule for the hour, and (ii) 20 MW in each hour. All such hours will be considered a Persistent Deviation.
  2. A pattern of deviation occurs generally or at specific times of the day.

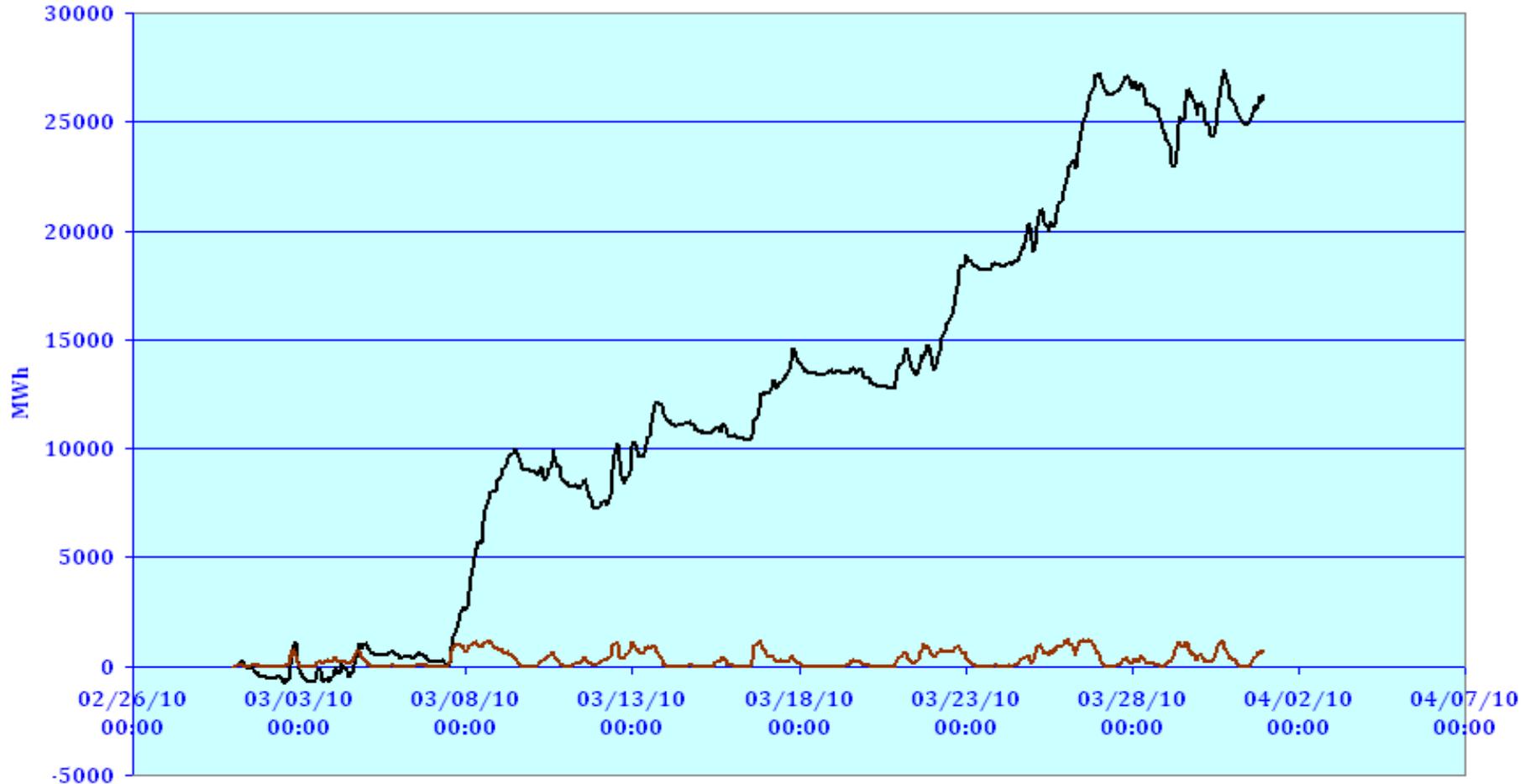


## Background

- To reduce balancing reserve requirement:
  - Rate case assumed a benchmark 30-minute persistence level of scheduling accuracy.
  - Rate case assumed random unbiased schedule imbalance and non-persistent errors; did not account for cost or risk of energy imbalance accumulation. Energy accumulation due to Generation Imbalance service was assumed to net to zero.
  - Persistent Deviation penalty helps to limit risk of energy imbalance accumulation; PD frequency was expected to be low if parties met assumed scheduling accuracy.
  - DSO 216 was established to limit reserve capacity use.
  
- If BPA had assumed significant schedule error persistence, reserve availability from FCRPS would likely have been lower and costs would have been higher; parties were expected to improve schedule accuracy.
  
- BPA did not intend imbalance service to be used as energy option.



# March 2010 Accumulated Imbalance from the BPA Wind Fleet



31 days of imbalance accumulation

— Actual: 26,213 MWh — 30 min: 732 MWh



## Imbalance Accumulation

- The quantity of imbalance accumulated by the wind fleet in March 2010 is significantly greater than anticipated in the rate case.
- BPA does not plan to rely on the real-time market to meet non-power constraints or system reliability.
  - Hydro operations require time to plan.
  - Constraints and management objectives are related to statutory requirements.
- Current mechanisms for management
  - Generation Imbalance charges (capped at 10% of market)
  - Persistent deviation penalty
  - DSO 216 provides a capacity limit but not an energy limit.
  - Forced marketing
- Future rate issues
  - Analysis will reflect actual scheduling error persistence.
  - Costs could increase.
  - FCRPS flexibility could be reduced.



## Goals of PD

- Ensure hydro operations close to plan
  - Maintain quantity of reserves available (reliability)
  - Avoid risk to non-power constraints
  - Ensure BPA is not dependent on market to meet non-power constraints
  - Avoid market risk
  
- Motivate parties to ensure that schedule errors are
  - Random
  - Unbiased
  - Non-persistent



## Goals of PD (continued)

- Encourage parties to act quickly to move schedule errors toward zero, based on:
  - Real-time monitoring of actual generation and imbalance
  - Best available wind forecast (improve on 30 min persistence)
  
- Discourage use of schedule error as put or call option:
  - BPA has seen operating conditions where the ability of the FCRPS to store or draft is as low as 1 kcsfd at Grand Coulee / Chief Joseph. If the current level of reserves are used on a sustained basis, BPA would not be able to meet reserves consistent with the storage/draft limitation.



## Rate Case Decisions on PD

- Recognized that a penalty charge is necessary to deter persistent and excessive schedule deviations.
- Removed concept of intent, recognized that parties may unintentionally incur PDs.
- Allowed large margins for error (Part A for GI, Part B for EI)
  - 20 MW or 15% of generation, whichever is greater (100 MW plant has average gen of ~30 MW)
  - Four hours of deviation in same direction (initial proposal 3 hr)
- Provided that patterns of deviation would be considered persistent deviation (Part C for generation and energy imbalance).
- Penalty is set at greater of 125% of highest incremental cost for the day or \$100/MWh for wind undergeneration; no payment for generation in excess of schedule.
- Provided 90-day exemption for plants that are testing.
- Reserved BPA the right to waive penalty.



## Application of 20 MW or 15% Margin for Variable Generation

- Average generation for 100 MW plant ranges from 20 MW to 30 MW. The 20 MW band provides an up-or-down range that is close to the average generation for a 100 MW plant. For plants larger than 134 MW, the limit is 15% of generation.
- This margin is intended to provide flexibility for wind volatility and ramping.
- Although wind is frequently volatile, periods of extreme volatility (very large up and down ramps combined with frequent changes of direction) are typically not more than a few hours long.

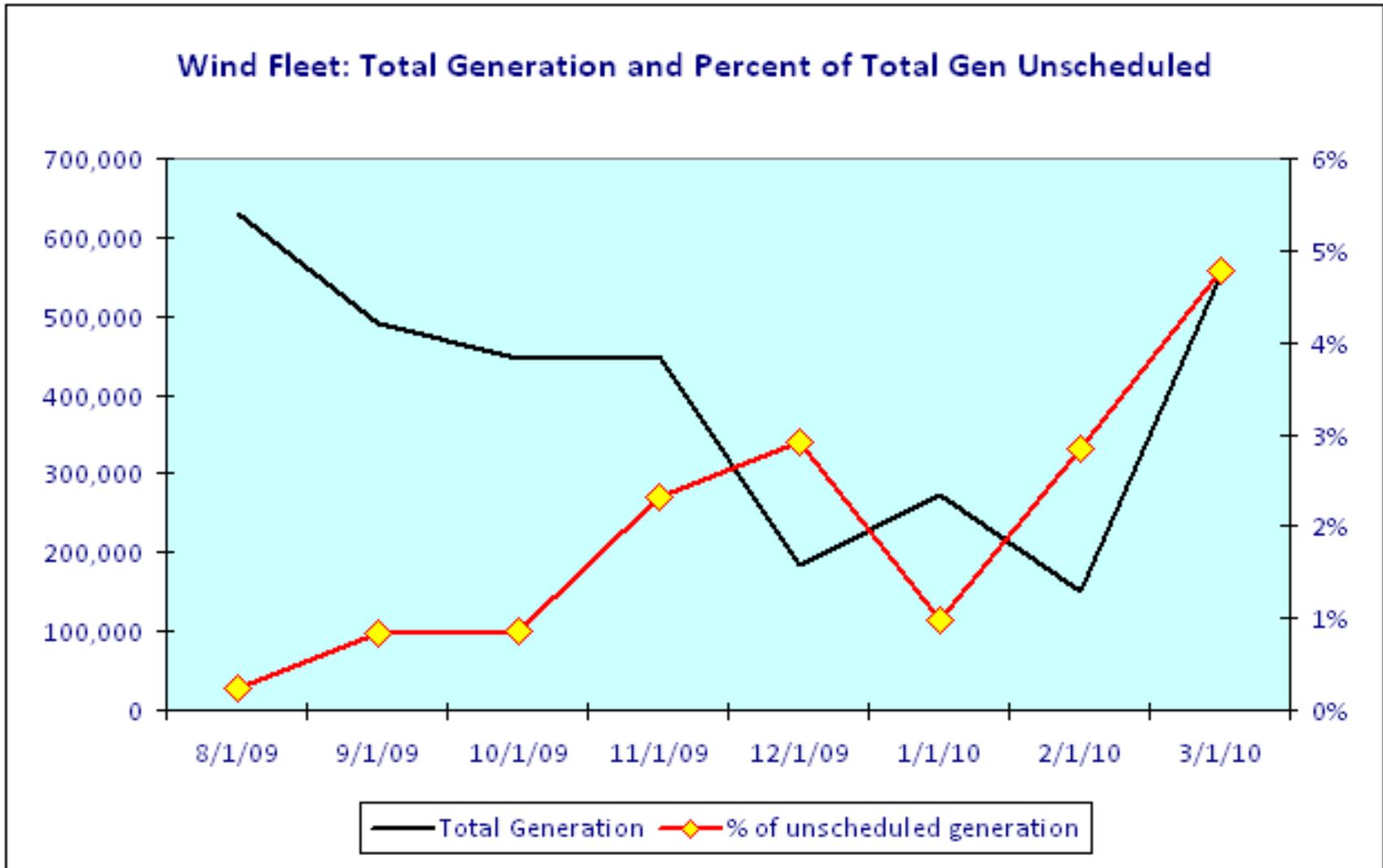


## Four-Hour Deviation Time Margin

- After reviewing 3-hour persistent deviation definition, rate case decision was to allow fourth hour. Parties requesting waivers are expected to have demonstrated effort toward accurate scheduling in second or third hours.
- 4 hours allows time for schedulers to recognize and adjust for wind ramps and wind volatility.
- Most wind ramps are less than 2 hours at plant level
  - November: 23 plants, 16,560 hours of operation, wind generation changed more than 20 MW or 15% from one hour to next 1,169 times (7%). It did so two consecutive hours only 194 times (1%). It did so 4 hours in a row only four times.
- If customer forecasts are failing at ramp prediction this indicates that it is critical to account for actual observations during ramp conditions and that this needs to be an area of forecast focus.



# Monthly Average Generation and Percent Unscheduled

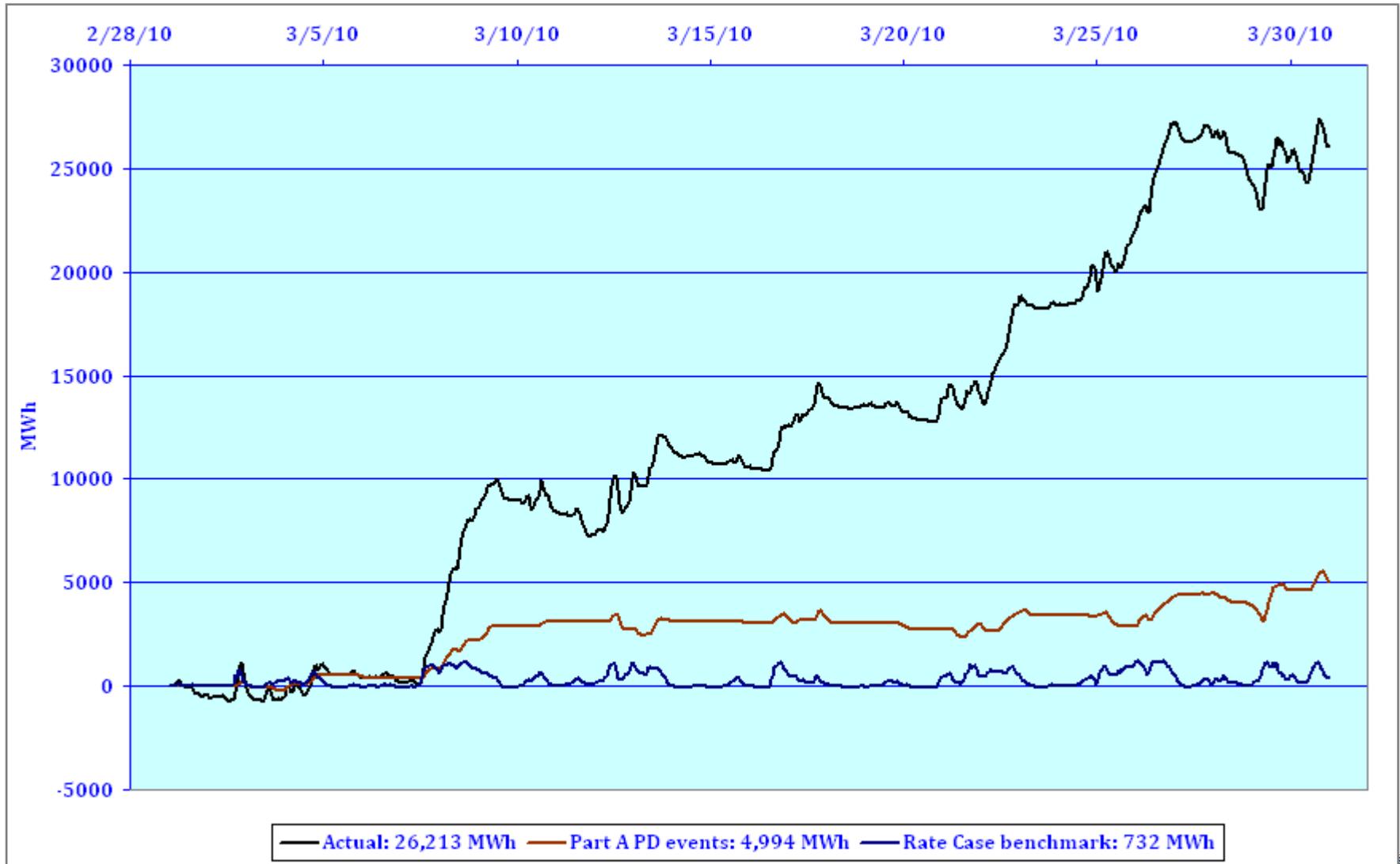


## Part A PD Events

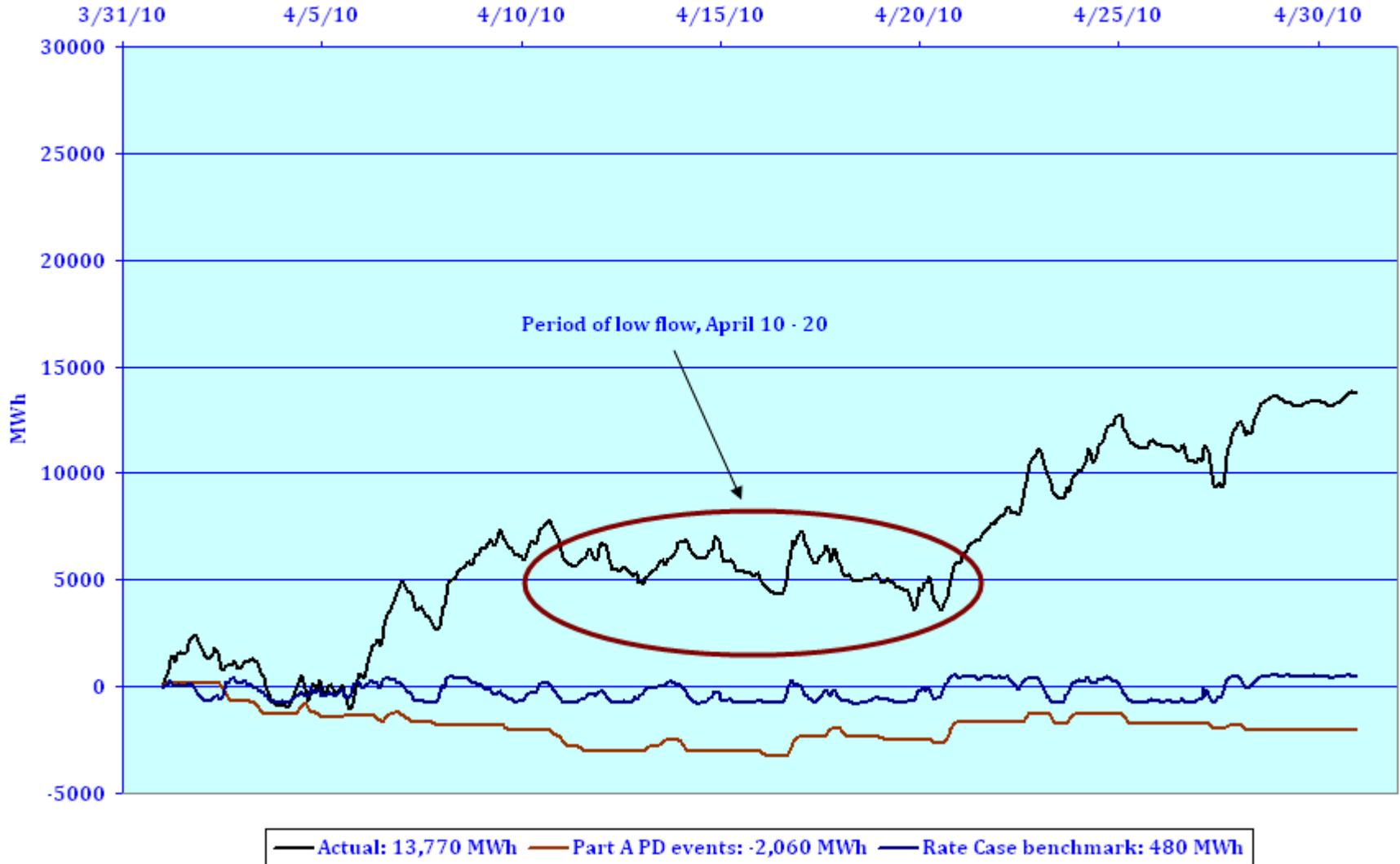
- October through March:
  - 23-24 plants, 250 Part A PD events
  - 177 of those PDs were at 4 plants
  - One plant averaged just over 2 events per month
  - 6 plants averaged 1-2 events per month
  - 5 plants averaged less than 1 event per month
  - 8 plants had no PDs (including both large and small plants)



# March 2010 Accumulated Imbalance from the BPA Wind Fleet



# April 2010 Accumulated Imbalance from the BPA Wind Fleet



## Part C Persistent Deviations

- Part C: A persistent deviation occurs if “A pattern of under-delivery or over-use of energy occurs generally or at specific times of day.”
- BPA’s Generation Imbalance Business Practice lists several examples of imbalances that could be considered persistent deviations under Part C:
  - 4.1.1 Negative deviations (overgeneration) greater than Band 1 for 6 or more consecutive LLH hours.
  - 4.1.2 Positive deviations (undergeneration) greater than band 1 for 6 or more consecutive HLH hours.
  - 4.1.3 Negative deviations greater than band 1 for 3 or more consecutive days at a specific time of day.
  - 4.1.4 Positive deviations greater than band 1 for 3 or more consecutive days at a specific time of day.
  - 4.1.5 Accumulated deviations greater than band 1 for 3 consecutive periods (HLH, LLH, HLH) or (LLH, HLH, LLH) that are positive during the HLH period(s) and negative during the LLH period(s).
  - 4.1.6 Large deviations in an hour(s) due to a transmission schedule or Generation Estimate not being submitted.

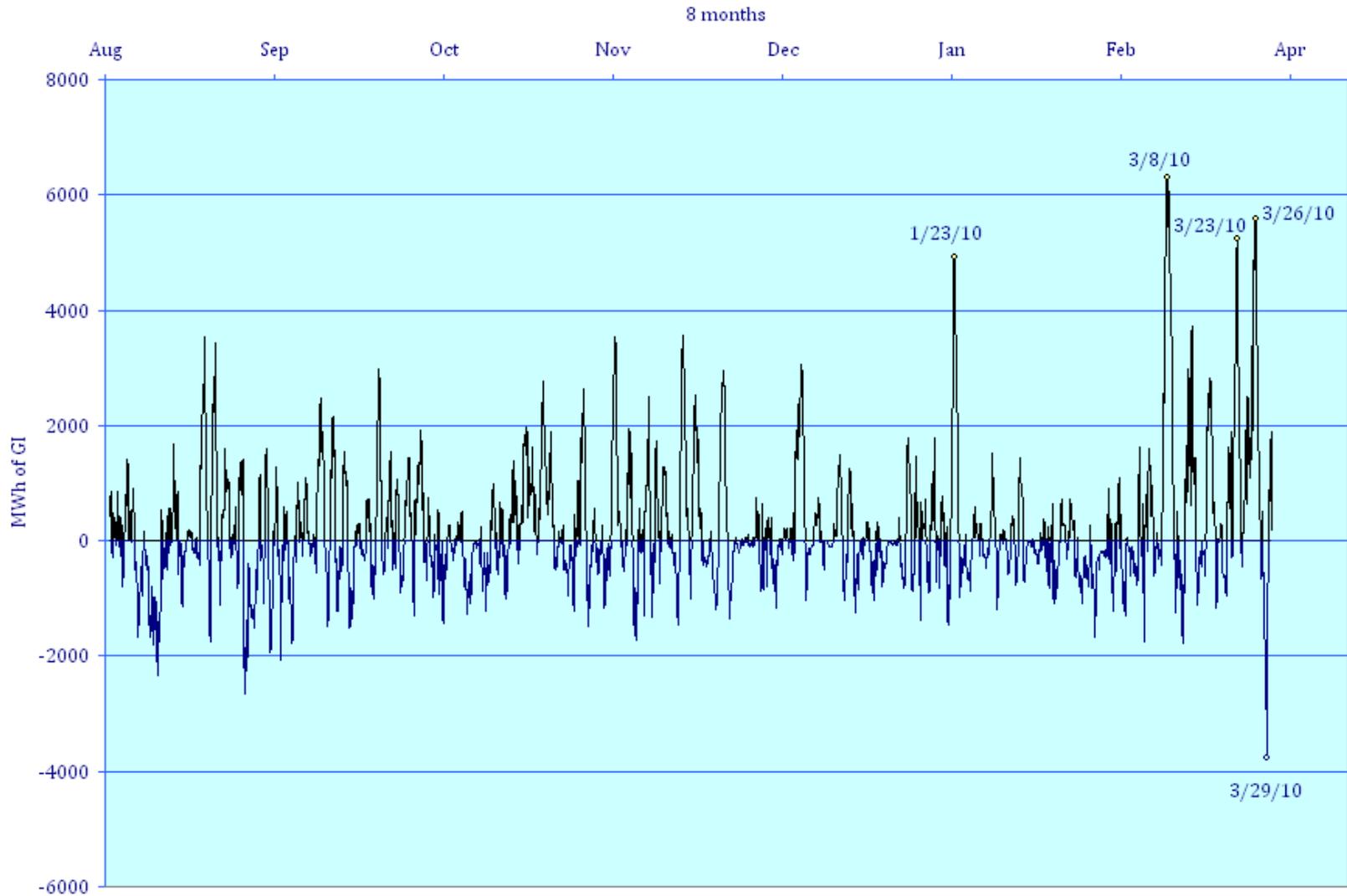


## Part C Persistent Deviations (continued)

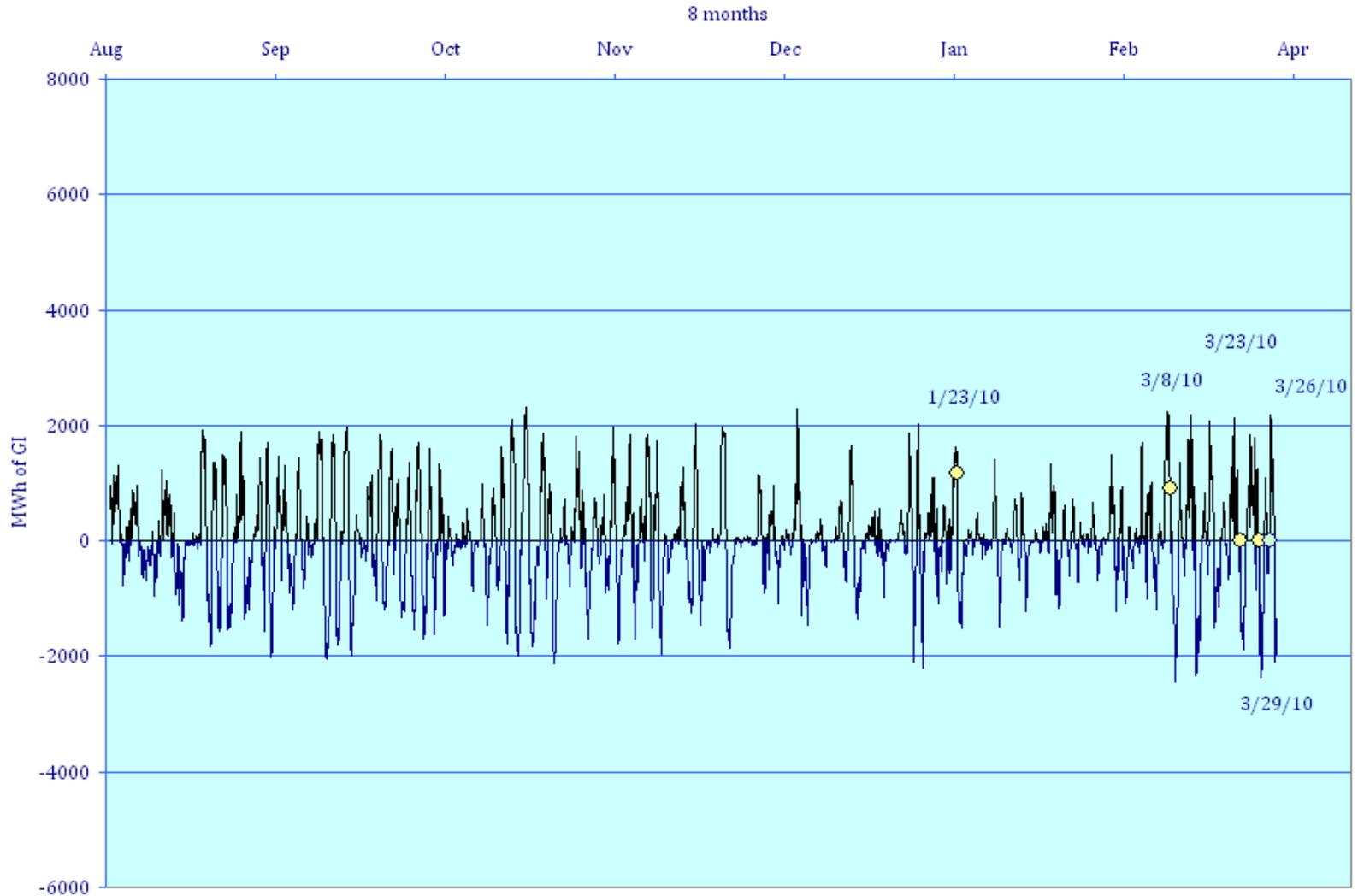
- BPA is becoming concerned about patterns of persistent deviation. A significant portion of energy imbalance accumulation is not being addressed through Part A PD enforcement.
- BPA is engaging customer discussion of Part C PDs, and we expect to begin accounting for Persistent Deviation penalties for patterns of schedule error.



# Rolling 24 Hour Accumulation, Actual

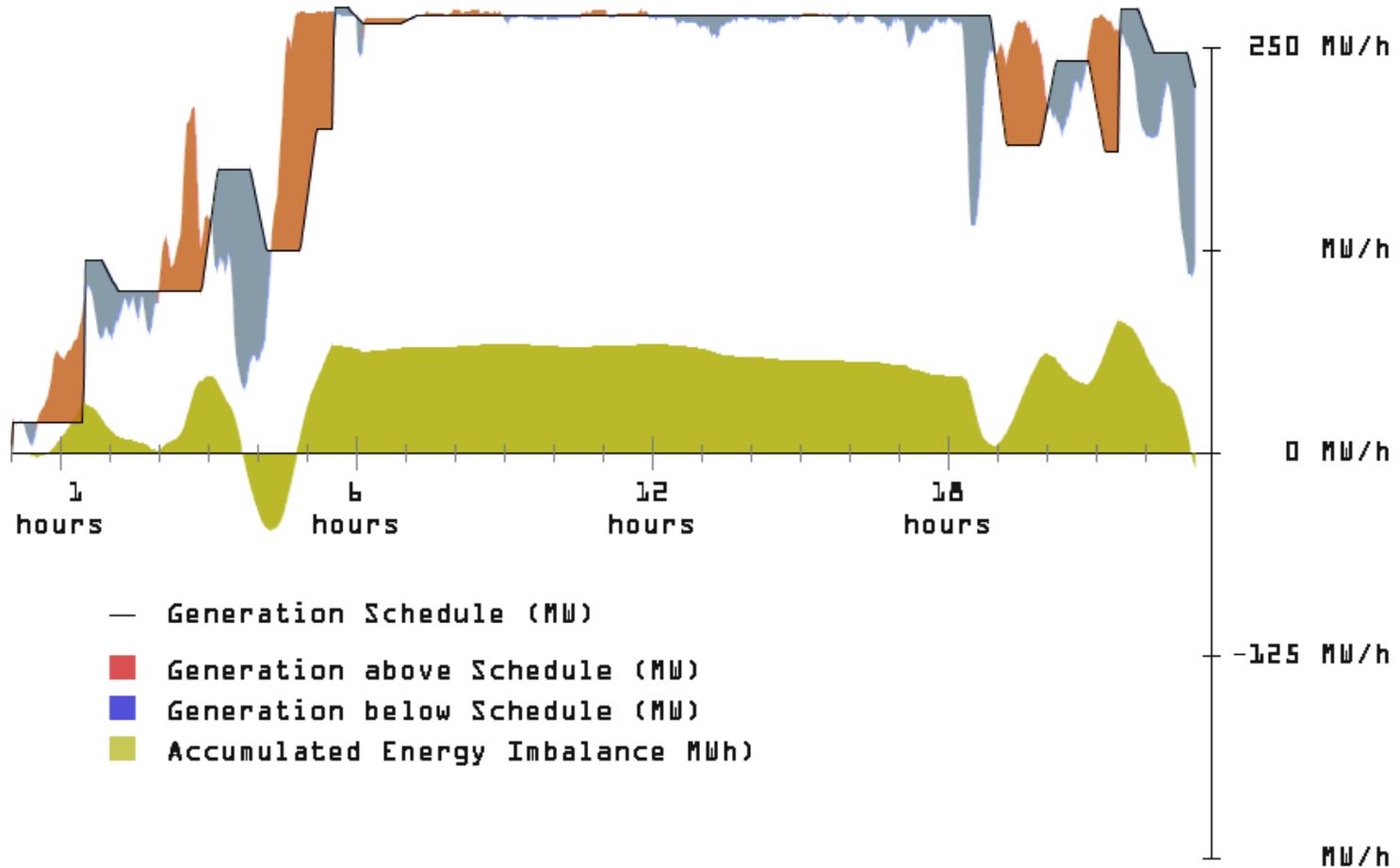


# Rolling 24 Hour Accumulation, Benchmark



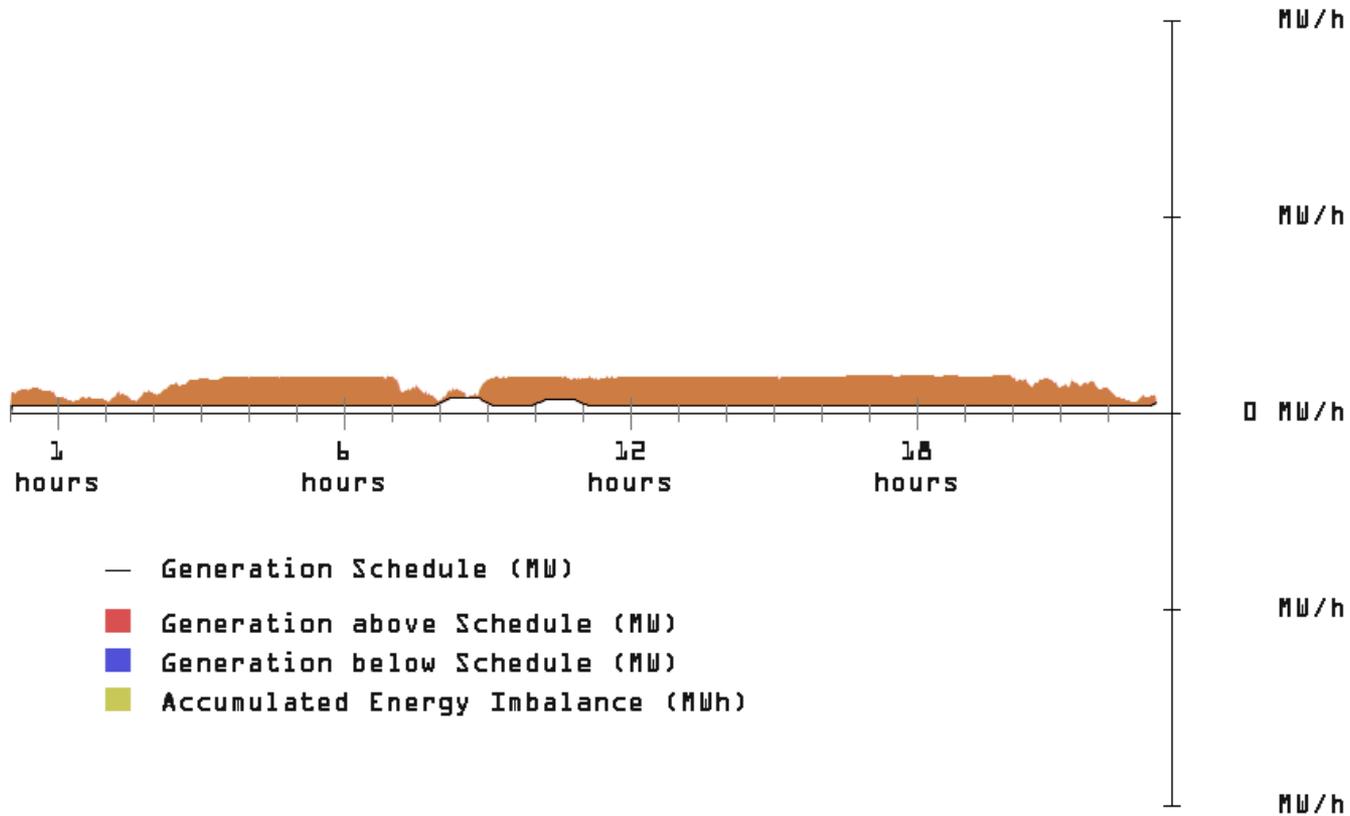
# Good Scheduling

- Total generation: 5,059 MWh
- Total accumulated imbalance: -8 MWh, 0.2%



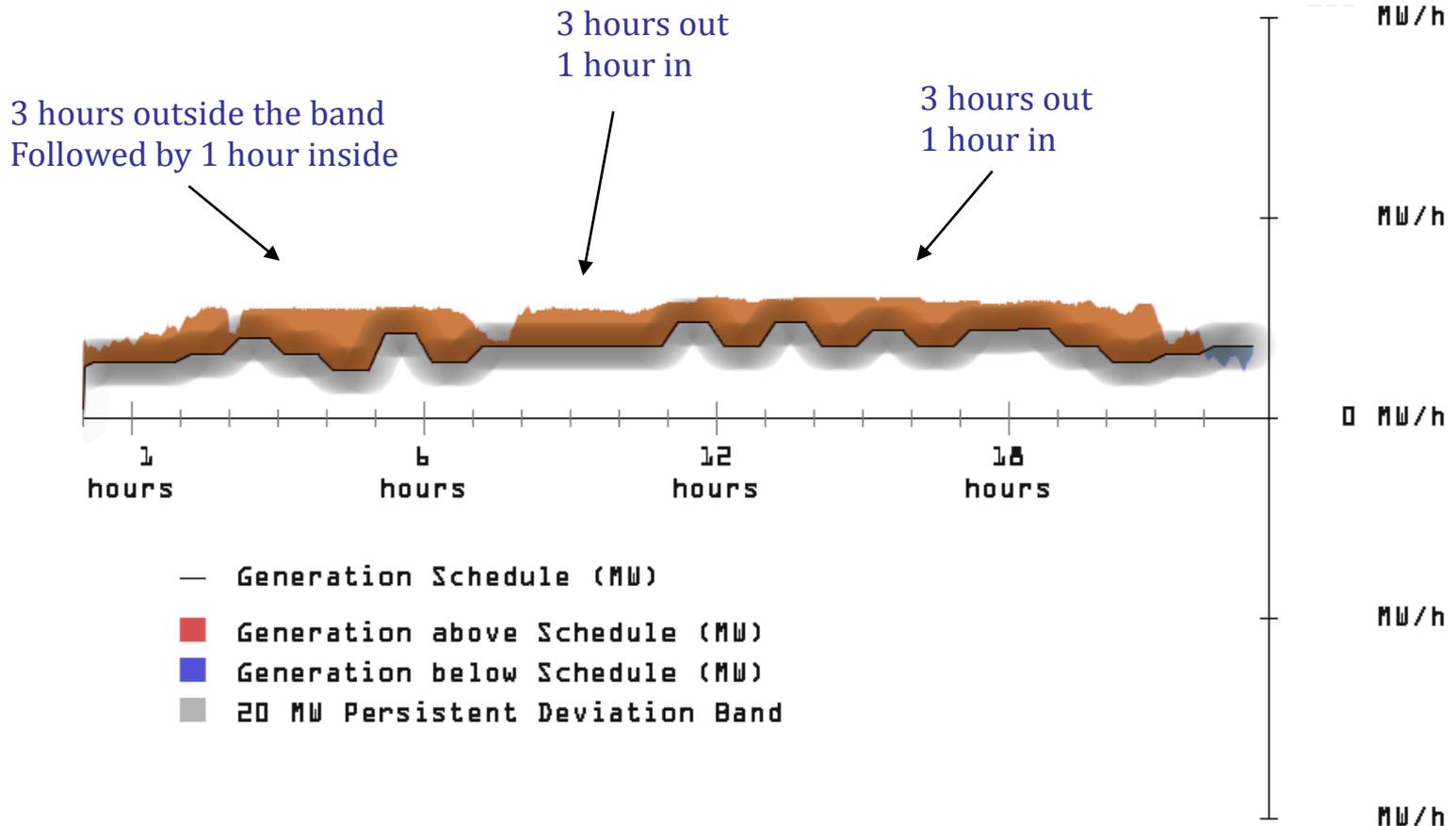
# Persistent Under Scheduling

- Total generation: 450 MWh
- Total accumulated imbalance: 316 MWh, 70%

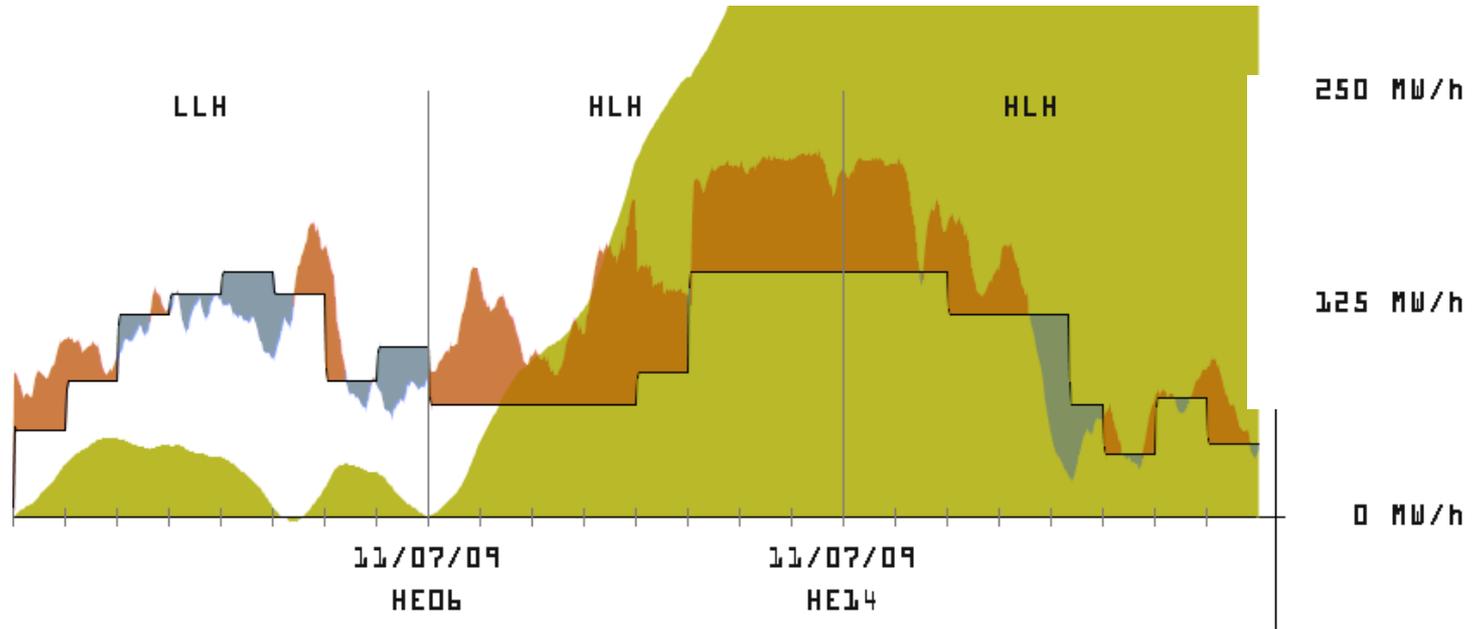


# Zigzag Scheduling

- Total generation: 1,573 MWh
- Total accumulated imbalance: 490 MWh, 31%



# Diurnal Pattern



- Generation Schedule (MW)
- Generation above Schedule (MW)
- Generation below Schedule (MW)
- Accumulated Energy Imbalance (MWh)

250 MW/h

125 MW/h

0 MW/h

125 MW/h

250 MW/h



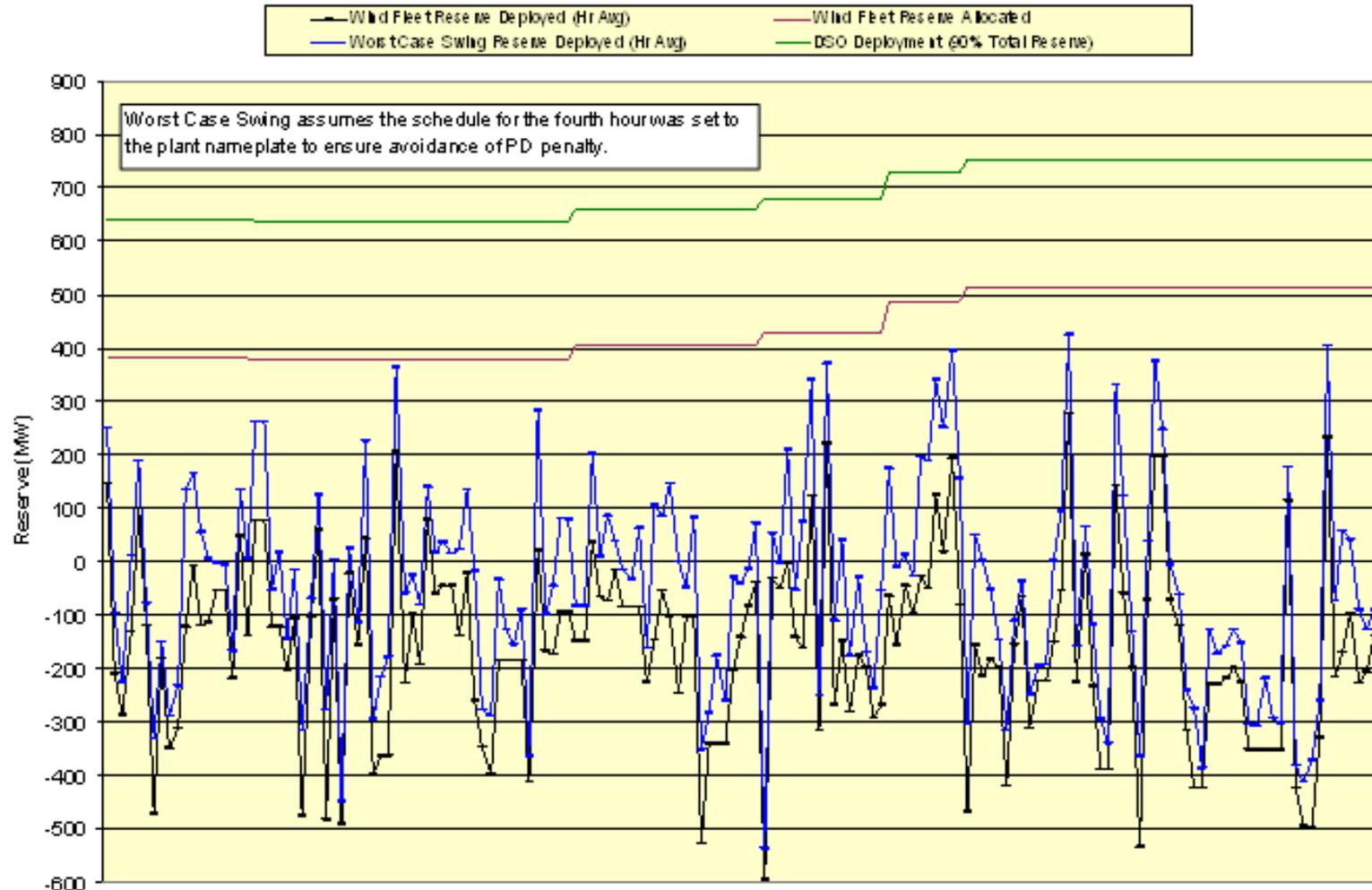
## Relationship of DSO 216 to Persistent Deviation

- Some wind generators have suggested that adjusting schedules to avoid persistent deviations could trigger DSO 216 events.
- Some wind generators have indicated they are incurring persistent deviations as a means of avoiding DSO 216 schedule curtailment.
- BPA has examined both these issues. We evaluated all PD events from October 1, 2009, through April 14, 2010, to test whether excessively modifying schedules for the 4th hour would have pushed the use of reserves to the point where a DSO 216 event would have been initiated. We found that even with extreme assumptions of scheduling behavior, adjusting schedules to avoid persistent deviation would be unlikely to trigger a DSO 216 event. There are 108 PD events with Positive Imbalance (over scheduled) and 163 PD Events with Negative Imbalance over the time period we evaluated.
- BPA examined data from several wind plants and found no relationship between timing of persistent deviation events and overall wind generation approaching DSO 216 limits.

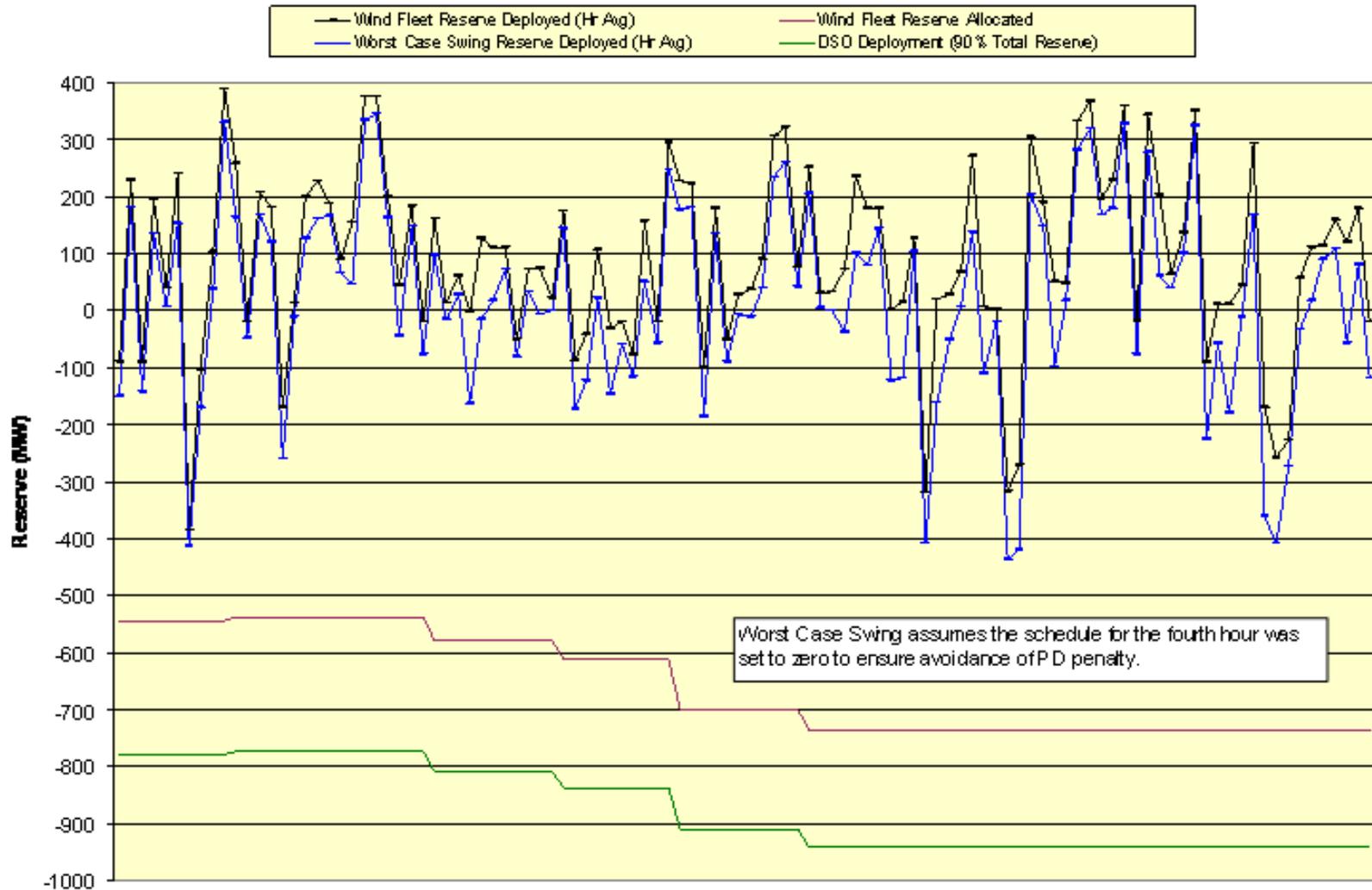


# Fourth Hour of 163 PD Events with Negative Imbalance (under scheduling; ranked by date)

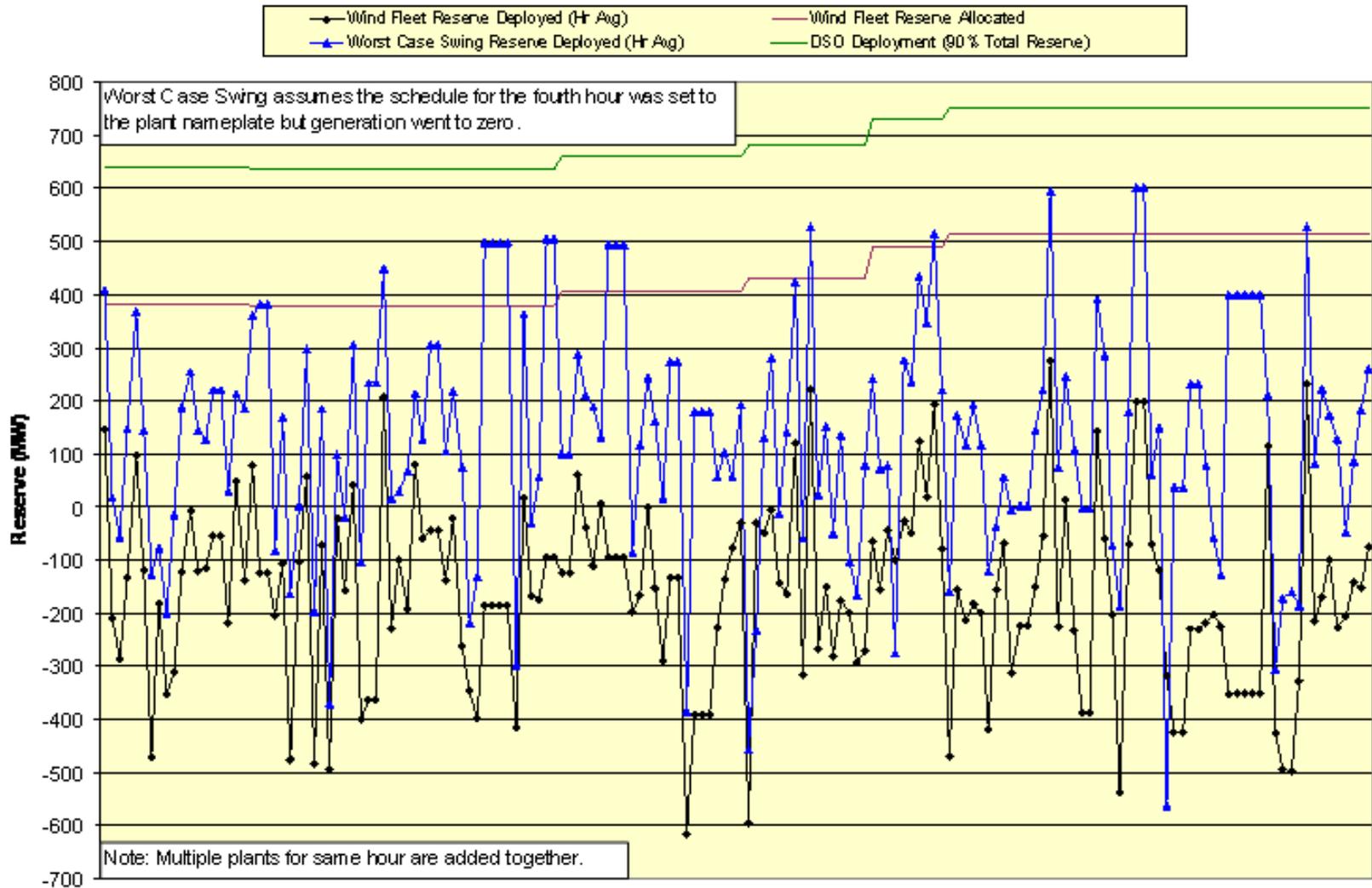
- For each event, we tested whether setting the schedule to zero or maximum nameplate capacity and using the actual generation for the 4th hour would increase use of reserves to the point where DSO 216 would be triggered. We found no occurrences where increased INC or DEC reserve use from changing the schedule for the 4th hour would cause a DSO 216 event.



# Fourth Hour of 108 PD Events with Positive Imbalance (over scheduling; ranked by date)



# Fourth Hour of 164 PD Events with Negative Imbalance (under scheduling; ranked by date)



## BPA Messages

- BPA expects to use both DSO 216 and PD:
  - The purpose of DSO 216 is to preserve system reliability.
  - PD helps ensure that BPA does not rely on forced marketing to meet operational objectives, encourages accurate scheduling, and mitigates risk of energy imbalance accumulation. 20 MW or 15% band addresses wind volatility.
  - BPA does not want customers to incur persistent deviation as a means of hedging or avoiding risk of DSO 216 schedule curtailments.
  - BPA analysis indicates that even extreme schedule changes to avoid persistent deviation do not cause DSO 216 to trigger.



## BPA Messages (continued)

- 4 hr window and 20 MW/15% band are expected to provide sufficient flexibility for nearly all volatility and ramps.
- Wind generators need to consider actual wind as well as forecast. Waiving PDs because of forecast error transfers wind customers' forecast risk to BPA.
- BPA will begin accounting for patterns of persistent deviation.
  - We do not encourage customers to modify schedules excessively to avoid PD penalties. If customer forecasting processes are inadequate to avoid accumulations over these timeframes, it suggests that customers should consider relying more heavily on actual observations in the near term and seek forecast improvements in the longer term.
- We are open to discussing modifications to the PD Penalty that will result in meeting the previously stated BPA objectives. We would prefer that scheduling practices improve so that customers do not incur the penalty.



# Energy Imbalance and Generation Imbalance



## Incremental Costs for EI/GI

- Current language in the 2010 Transmission and Ancillary Service Rate Schedules
  - Section II Ancillary Services Rates, D. Energy Imbalance Service, 2 (a) BPA Incremental Cost
  - Section III Control Area Service Rates, B. Generation Imbalance Service, 2 (a) BPA Incremental Cost
  - BPA's incremental cost will be based on an hourly energy index in the Pacific Northwest. If no adequate hourly index exists, an alternative index will be used. BPA-TS will post the name of the index to be used on the OASIS at least 30 days prior to its use. BPA-TS will not change the index more often than once per year unless BPA-TS determines that the existing index is no longer a reliable price index.
  - Energy Imbalance: For any hour(s) that the energy index is negative, no credit is given for positive deviations (actual energy delivered is more than scheduled).
  - Generation Imbalance: For any hour(s) that the energy index is negative, no credit is given for positive deviations (actual generation less than scheduled).



## Incremental Costs for EI/GI (continued)

- Goal to reflect the cost of EI/GI based on a transparent NW power index that best matches the characteristics of the product:
  - Currently using the Dow-Jones Mid-C Day-Ahead index that provides a daily heavy load hour (HLH) price and daily light load hour (LLH) price.
  - The HLH price is applied to each hour defined as HLH by the North American Electricity Reliability Corporation (NERC). The same is done for LLH.
  - Liquidity concerns regarding the Dow-Jones Mid-C hourly index kept us from using it:
    - Average Liquidity: 150 aMW
    - Top deciles liquidity: 320 aMW
    - Lowest deciles liquidity: Almost 0 aMW (over 8% with liquidity)



## Intent: Change Energy Index Used for Incremental Costs for EI/GI

- Given hourly fluctuations of EI/GI product, the market index that appropriately reflects the cost of this product would be an hourly NW power index.
  - Products that fluctuate hourly need to be valued at hourly price.
  - An Hourly index is a more accurate representation of hourly energy values than using a daily index and spreading it across the hours.
  
- We are exploring transitioning to an hourly index. Liquidity concerns remain on using the Dow-Jones Hourly Index, but Powerdex hourly index looks promising.
  - Liquidity is significantly higher...sample exploration suggest liquidity is roughly 4 times higher.
  - Likely reason: Powerdex captures both system-to-system transactions and Mid-C only transactions, while Dow Jones Mid-C captures only the trades at Mid-C.



## **Intent: Change Energy Index Used for Incremental Costs for EI/GI (continued)**

- We are exploring transitioning to an hourly index. Liquidity concerns remain on using the Dow-Jones Hourly Index, but Powerdex hourly index looks promising (continued):
  - Need to explore contractual issues with Powerdex on the use of the index.
  - BPA will explore submitting hourly transactions to the index; would bolster an already strong liquidity level.



## How will Intra-hour scheduling impact imbalance energy settlement?

- Intra-hour scheduling raises issues with the imbalance energy rate schedule provisions that should be addressed in the rate case.
- If left as-is, the imbalance energy settlement would not be affected – it would continue to be the integrated actual amount versus the integrated scheduled amount.
  - This could lead to problems if there is over- or under-generation in the first half-hour that is then ‘corrected’ in the second half-hour by scheduling too far in the other direction.
  - Would cause excess movement on the system but could help with persistent deviation issues and could be considered another form of persistent deviation given the planned failure to schedule accurately, but could avoid some cases of imbalance energy accumulation and persistent deviation as currently defined.



# Recent Experience With Wind Scheduling Accuracy



## Wind Experience with Scheduling Accuracy

- The following slides depict scheduling accuracy seen by BPA for the wind fleet; the explanations of the slides are:
  - The basepoint forecast is the sum of operator-supplied hour-head wind generation forecasts. It is not supplied or modified by BPA.
  - The Persistence Forecast uses only the Actual Wind Gen at a specific time in the prior hour (30 or 45 minutes back) as the forecast for the next hour.
  - Both Forecasts include a ramp from xx:50 to xx:10. Forecast Error is based on Hourly Averages of Actual Wind Gen vs. the two forecasts.
  - Errors are reported as Avg MW, Avg Abs Value MW, and Avg Abs Value MW as Percent of Avg Actual Wind Generation for the month.
  - Positive Error = Under Forecast (Actual Wind Gen > Forecast);  
Negative Error = Over Forecast (Actual Wind Gen < Forecast).
  - Study uses 5-min data via SCADA/PI.
  - SMALLER ERROR, CLOSER TO ZERO, IS “BETTER” (GREEN SHADING).



## Wind Experience with Scheduling Accuracy, 30 Min Persistence Comparison

<b>BASEPOINT vs. 30-MIN PERSISTENCE</b>			<b>Average MW Error ("Bias" Indicator)</b>		<b>Average Abs Value MW Error</b>		<b>Average Abs Value MW Error As % Of Avg Actual Wind Gen</b>	
<b>Month</b>	<b>Average Actual Wind Gen</b>	<b>Std Deviation Actual Wind Gen</b>	<b>BASEPOINT Error</b>	<b>30-MIN PERSISTENCE Error</b>	<b>BASEPOINT Error</b>	<b>30-MIN PERSISTENCE Error</b>	<b>BASEPOINT Error</b>	<b>30-MIN PERSISTENCE Error</b>
May-08	539	436	34.2	-0.5	84.1	51.3	15.6%	9.5%
June-08	682	433	7.5	0.7	91.9	64.3	13.5%	9.4%
July-08	554	407	-11.4	0.1	83.0	57.2	15.0%	10.3%
August-08	505	431	-2.7	-0.8	82.5	57.9	16.3%	11.5%
September-08	299	379	-8.7	-1.1	61.7	42.5	20.6%	14.2%
October-08	358	394	-1.9	0.5	63.4	50.9	17.7%	14.2%
November-08	341	403	-5.3	-0.1	65.0	50.0	19.1%	14.7%
December-08	449	424	0.8	0.6	75.1	53.4	16.7%	11.9%
January-09	499	551	5.9	0.2	62.8	47.3	12.6%	9.5%
February-09	247	371	6.9	-1.4	54.7	42.4	22.1%	17.2%
March-09	726	616	10.9	3.6	101.6	83.7	14.0%	11.5%
April-09	692	626	4.9	-2.4	95.1	74.5	13.8%	10.8%
May-09	676	660	1.4	1.2	96.0	79.9	14.2%	11.8%
June-09	843	622	-5.4	0.3	102.2	93.1	12.1%	11.0%
July-09	602	622	4.1	0.5	81.0	69.3	13.5%	11.5%
August-09	847	663	-3.2	0.6	96.2	85.7	11.4%	10.1%
September-09	656	667	4.1	1.3	87.7	81.9	13.4%	12.5%
October-09	601	625	7.9	-0.2	82.6	78.3	13.7%	13.0%
November-09	566	564	11.5	-0.5	96.7	83.8	17.1%	14.8%
December-09	258	453	5.6	-0.2	53.3	43.8	20.7%	17.0%
January-10	367	453	2.6	0.0	77.6	68.4	21.1%	18.6%
February-10	226	301	-7.9	-0.2	59.7	49.0	26.4%	21.7%
March-10	740	729	33.7	2.1	142.3	117.7	19.2%	15.9%



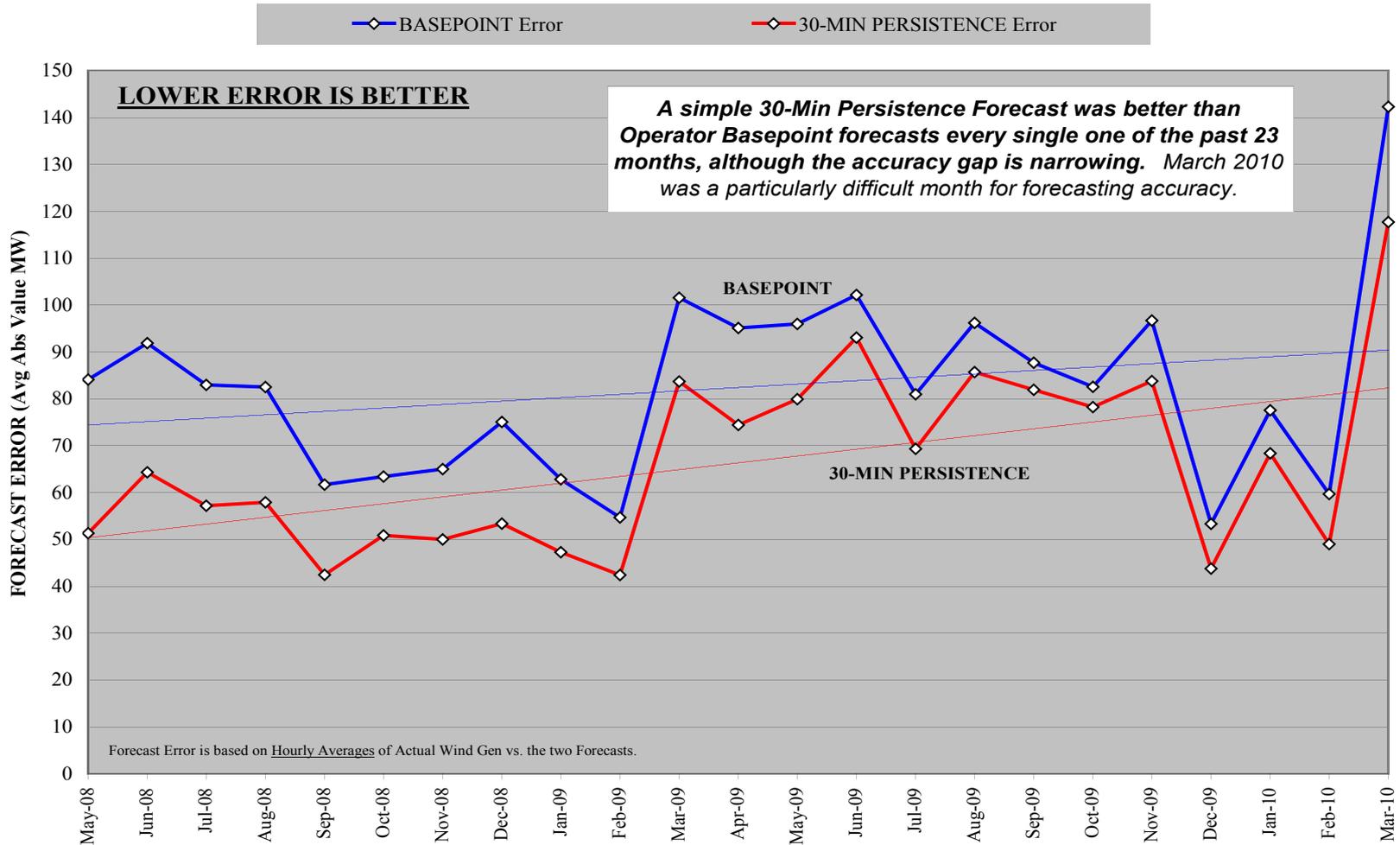
## Wind Experience with Scheduling Accuracy, 45 Min Persistence Comparison

<b>BASEPOINT vs. 45-MIN PERSISTENCE</b>			<b>Average MW Error ("Bias" Indicator)</b>		<b>Average Abs Value MW Error</b>		<b>Average Abs Value MW Error As % Of Avg Actual Wind Gen</b>	
<b>Month</b>	<b>Average Actual Wind Gen</b>	<b>Std Deviation Actual Wind Gen</b>	<b>BASEPOINT Error</b>	<b>45-MIN PERSISTENCE Error</b>	<b>BASEPOINT Error</b>	<b>45-MIN PERSISTENCE Error</b>	<b>BASEPOINT Error</b>	<b>45-MIN PERSISTENCE Error</b>
May-08	539	436	34.2	0.1	84.1	61.6	15.6%	11.4%
June-08	682	433	7.5	-0.1	91.9	77.2	13.5%	11.3%
July-08	554	407	-11.4	1.0	83.0	68.1	15.0%	12.3%
August-08	505	431	-2.7	-0.5	82.5	69.6	16.3%	13.8%
September-08	299	379	-8.7	-1.6	61.7	50.8	20.6%	17.0%
October-08	358	394	-1.9	0.9	63.4	59.5	17.7%	16.6%
November-08	341	403	-5.3	-0.9	65.0	59.1	19.1%	17.3%
December-08	449	424	0.8	0.6	75.1	64.3	16.7%	14.3%
January-09	499	551	5.9	-0.4	62.8	56.1	12.6%	11.3%
February-09	247	371	6.9	-0.9	54.7	50.1	22.1%	20.3%
March-09	726	616	10.9	1.9	101.6	99.4	14.0%	13.7%
April-09	692	626	4.9	-3.4	95.1	90.3	13.8%	13.1%
May-09	676	660	1.4	0.5	96.0	95.9	14.2%	14.2%
June-09	843	622	-5.4	-0.1	102.2	111.1	12.1%	13.2%
July-09	602	622	4.1	-0.8	81.0	84.4	13.5%	14.0%
August-09	847	663	-3.2	0.7	96.2	104.9	11.4%	12.4%
September-09	656	667	4.1	1.7	87.7	98.9	13.4%	15.1%
October-09	601	625	7.9	0.8	82.6	94.4	13.7%	15.7%
November-09	566	564	11.5	-2.7	96.7	100.6	17.1%	17.8%
December-09	258	453	5.6	-1.7	53.3	51.7	20.7%	20.0%
January-10	367	453	2.6	-0.5	77.6	79.5	21.1%	21.6%
February-10	226	301	-7.9	0.1	59.7	59.3	26.4%	26.3%
March-10	740	729	33.7	1.2	142.3	138.2	19.2%	18.7%



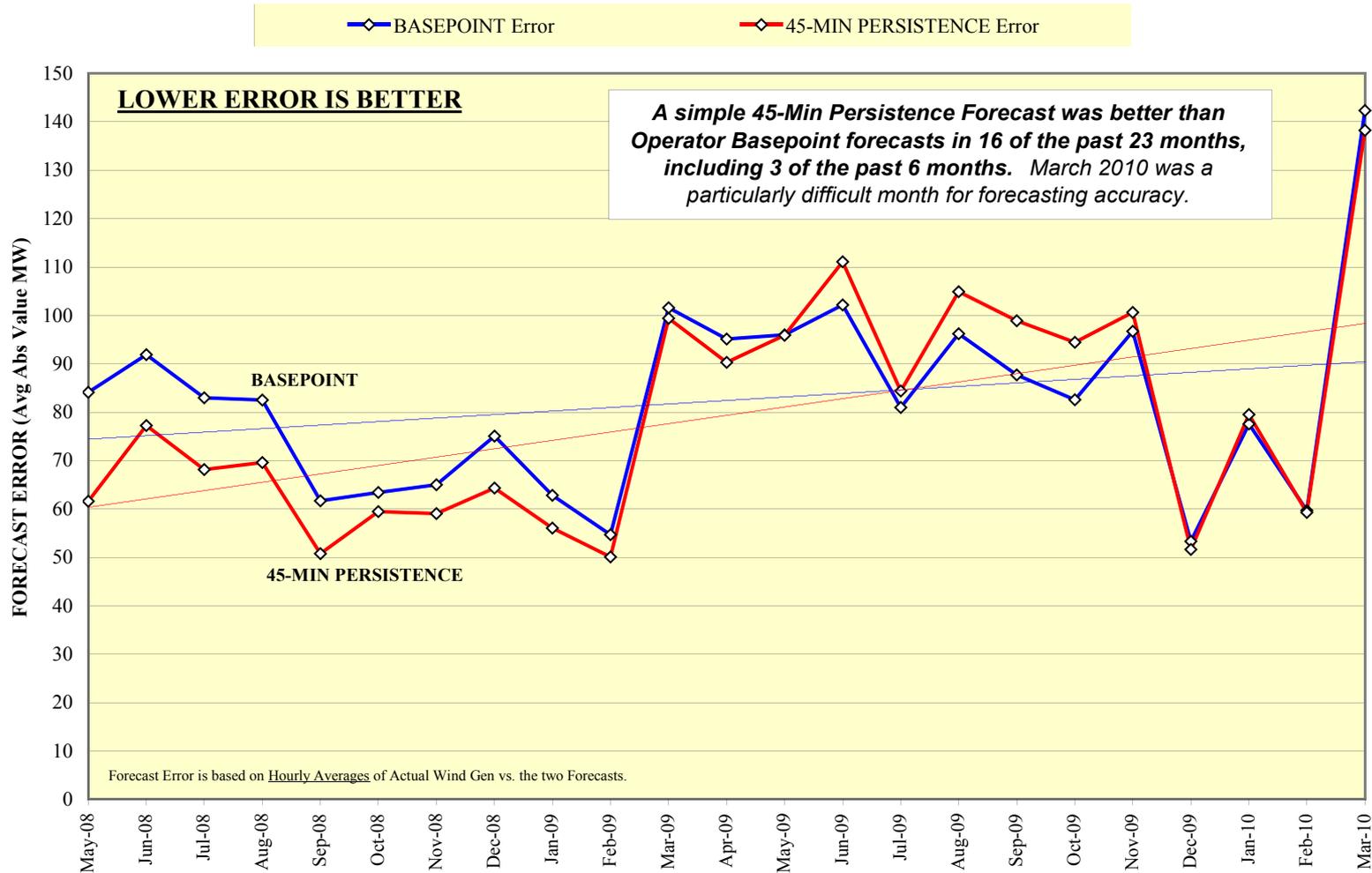
# Wind Experience with Scheduling Accuracy, 30 Min Persistence Comparison

**WIND GENERATION FORECAST ACCURACY: May08 - Mar10, By Month  
Operator Basepoint vs. 30-Min Persistence Forecast**



# Wind Experience with Scheduling Accuracy, 45 Min Persistence Comparison

**WIND GENERATION FORECAST ACCURACY: May08 - Mar10, By Month**  
**Operator Basepoint vs. 45-Min Persistence Forecast**



# Provisional Balancing Service



## Options Under Consideration for Modification of Wind Balancing Service (WBS)

- Currently, BPA forecasts the installed VER capacity expected to take Wind Balancing Service when establishing the reserve requirement. BPA currently provides WBS without any limitation on the amount of wind generation that we serve during a rate period. We would like to discuss a modification that would limit provision of the service on a firm basis to only those customers who elect to take WBS for the rate period:
  - Self-suppliers will need to commit to self-supply for the duration of the rate case. Getting a commitment from other customers to take WBS would be consistent.
  - Commitment term length could eventually be longer than one rate period. Term length will become critical when we define the need for generation inputs acquisitions.
  - The sum of customer commitments to take service would then be used when establishing the reserves maximum for the rate period in the final ROD.



## WBS Firm Availability

- Any Wind Generating Resource that is currently interconnected or has a large or small generator request in the queue with an expected interconnection date during the FY12-13 rate period must elect to take WBS or elect to self-supply.
- Self-supply customers who find they are unable to continue with self-supply during a rate period would be offered “Provisional Balancing Service.” Customers cannot request provisional balancing service; the service is only offered as a bridge to Firm WBS during a rate period.
- The reserves held for Wind Balancing would not increase when Provisional Balancing Service is offered, and Provisional Balancing Service would be subject to additional curtailments and reductions under DSO 216 to protect the quality of Firm Balancing Service.



## Pricing of Provisional Balancing Service

- The amount of INC and DEC reserves held for Wind Balancing Service would not increase when Provisional Balancing Service is taken, but the deployment of reserves within those limits would increase. There is a cost associated with increased deployment. The amount charged for Provisional Balancing Service would need to be developed. If we use the “Conditional Firm” approach used for transmission service, the rate would be equivalent to Firm Balancing Service, but the quality would be lower.
- Technical Operations has determined that they could separate Provisional Balancing Service from Firm Balancing service for DSO 216 purposes, and they could set a lower reserve use threshold trigger for Provisional Balancing Service customers.
- Because Provisional Balancing Service may create scheduling incentives that differ from WBS, BPA will need to evaluate the potential for Provisional Balancing Service to impact BPA hydro operations and develop alternative PD metrics or other tools to mitigate those impacts.



## Connecting The Dots....*Where We Are*

- DSO 216 maintains system reliability and BPA balancing reserve capacity commitments within defined parameters, provides customers with the ability to take responsibility in exchange for lower costs, and will continue to be an essential tool for variable energy resource integration.
- The ability of the BPA system to provide balancing services is contingent on the nature of imbalance service. BPA does not view the provision of energy or generation imbalance service as a remarketing service or as a risk mitigation measure for customer responsibilities under DSO 216.
- BPA does not intend to rely on spot market activity on a planning basis to meet mandatory reliability or non-power requirements. BPA will need to continue to have tools to minimize accumulations to avoid additional costs in the rate design and to protect BPA system operations.
- Together these approaches allow BPA to reliably operate while interconnecting a large wind fleet at low cost without making expensive and potentially unnecessary resource acquisitions.



## Connecting The Dots....*Where We May Go*

- Provisional Balancing Service provides a default service for parties who attempt and fail to self supply all or a portion of their service or cannot accurately forecast when they need service.
- BPA is developing the tools to allow wind developers and the purchasers of their output to develop their own plan to supply their balancing service.
- BPA is open to a discussion on the right sequence in the development of tools and the development of different levels of service.



## Next Steps

- **27 May 2010:**
  - Workshop will be a continuation of the topics presented today.
  
- **17 June 2010:**
  - Workshop will cover operating reserves, scaling methodology and the installed wind capacity forecast.



## Wrap Up

- BPA would like to continue to hear your feedback regarding the topics we discussed today.
- Share your view today or feel free to submit a written response to:
  - [techforum@bpa.gov](mailto:techforum@bpa.gov).
  - Please state **“2012 Rate Case”** in the subject line.
- Our intent is to understand customer interest and the priority of topics to capture in the parking lot. This information will help inform the topics to focus on for developing the workshop schedule.
- We look forward to working together on these complex issues.

