2012 BPA Rate Case
Customer Workshop

Generation Inputs/Wind Balancing Service

June 17, 2010

Agenda

1. Parking lot issues for wind/generation input topics
2. Operating Reserves (Contingency Reserves)
3. Installed Wind Capacity Forecast for the BPA Balancing Authority Area (BAA)
4. Wind Scaling Methodology Review
5. Wind Scaling Methodology Test - Update
6. Wrap up and next steps

About Today's Discussion

- We want to share our current thinking about Operating Reserves, Installed Wind Capacity Forecast and Scaling Methodology.
- 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	Covered in 12 May and 27 May 2010 workshops
2	DSO 216 – Experience to date	Covered in 12 May 2010 workshop
3	Generation Imbalance relationship to within-hour balancing	Covered in 12 May 2010 workshop
4	Incentive for scheduling accuracy	To be scheduled for August in Rate Design
5	Use of 120-hour peaking capacity for costing methodology vs. use of instantaneous capacity for reserve requirement calculation	Covered in 14 April 2010 workshop
6	Review of BPA's five services/protocols related to wind integration for duplication and consistency, esp. with regard to Persistent Deviation Penalty	Covered in 12 May 2010 workshop
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 for August in Rate Design
8	Tiered wind integration rate structure based on whether customers are committed to scheduling on a ½ hour basis	To be scheduled for August in Rate Design
9	Modify BPA's intra-hour scheduling policy to allow for incremental changes in wind schedules as well as the decremental changes currently allowed	Refer topic to Wind Integration Team (WIT) Quarterly Review
10	Formula rate for wind	To be scheduled for July in Rate Design/Cost Allocation
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 for August in Rate Design

Parking Lot Issues (continued)

	WIND/GENERATION INPUTS PARKING LOT TOPICS	
12	Scaling methodology – revisit	Covered in 14 April 2010 and 17 June 2010 workshops
13	Timeline for decisions re. assumptions	See Workshop Schedule Each workshop
14	Timing for: •Self-supply •Within-hour scheduling	
15	Wind experience to date	Covered in 12 May 2010 workshop
16	Periodic presentations from the WIT to provide updates on WIT projects over the rate period	See Workshop Schedule
17	Marginal pricing for capacity sold as ancillary and control area services	To be scheduled for August in Cost Allocation/ Rate Design
18	Inclusion of Energy Shift costs in the variable cost component of Gen Input costs.	Covered in 12 May 2010 workshop
19	Take a pro-rata reduction in reserves from wind during a feathering/curtailment rather than taking the full amount.	Refer topic to Wind Integration Team (WIT) Quarterly Review
20	If default on self-supply, what is the rate impact to them?	Covered in 12 May 2010 workshop
21	New Persistent Deviation design for the next rate case that meets the objective.	Covered in 27 May 2010 workshop To be scheduled in Rate Design
22	Look at different times of the year in setting up Persistent Deviation design	See Workshop Schedule
23	If a project leaves BPA during the rate period, can a failed self-supplier take over the reserve allocation?	To be scheduled

OPERATING RESERVES (CONTINGENCY RESERVES)

Operating Reserves

- Operating Reserves Quantity Forecast
  - Current vs. Proposed Standard
  - Firm Contingent Tagging
- Cost Allocation

Operating Reserves (Contingency Reserves) Forecast Assumptions for the Initial Proposal

- For the Initial Proposal, an assumption of the amount of generation inputs (MWs) for Operating Reserves (supplied by BPA-PS) is needed to develop the federal obligation amount, determine cost allocation, and develop a rate design.
- The forecasted amount of Operating Reserves is dependent on whether the current BAL-002-0 (5x7) Western Electricity Coordinating Council (WECC) Standard, proposed BAL-002-WECC-1 (3x3) WECC Standard, or some combination of the two is selected. The WECC requirement must be satisfied by the BAA at all times:
  - BAL-002-0 (5% of hydro and wind; 7% of thermal and other) is the currently effective WECC Standard.
  - The proposed standard BAL-002-WECC-1 (3% of generation; 3% of load) is currently before the Federal Energy Regulatory Commission.
  - BPA is evaluating alternatives to forecast the quantity based on implementation assumptions for the proposed WECC Standard.

Operating Reserves (Contingency Reserves) Forecast Assumptions for the Initial Proposal continued

- 2010 rates assumption was that the current (5x7) standard was in effect for the first six months of the rate period and the proposed (3x3) standard was in effect for the last 18 months of the rate period.

- Commission decision may not be made in time to be reflected in the assumptions for the Initial Proposal.

Preliminary Analysis of Potential Impacts of Modeling Firm Contingent Energy Schedules

- Firm Contingent Background
  - BPA is considering requiring that wind energy from projects located in its balancing authority area carry a “firm contingent” energy product code instead of “firm” on transmission schedules or e-Tags. Changing tags to firm contingent will help clarify the respective responsibilities of the balancing authorities during wind ramps and provide better response to transmission operator concerns.
  - Additional background on firm contingent is available through the BPA Web site at http://www.bpa.gov/corporate/WindPower/events.cfm.
  - BPA will decide this summer whether to implement Firm Contingent tagging.

Preliminary Analysis of Potential Impacts of Modeling Firm Contingent Energy Schedules

- IF BPA Decides to Implement the Firm Contingent Tagging
  - BPA expects to put the Firm Contingent tagging requirement in place starting October 1, 2010, and it would last until such time as the new WECC or national standards for tagging wind energy go into effect.
  - Firm Contingent tagging may impact the amount of generation inputs needed to meet the Operating Reserves obligation in the BPA BAA for the rate period. There is a potential MW reduction in the amount of Operating Reserve from federal generation should Firm Contingent tags be implemented.
  - The drivers for total Operating Reserves will also include changes to self/third-party supply elections and the decision on the proposed changes to WECC BAL-002.

Preliminary Analysis of Potential Impacts of Modeling Firm Contingent Energy Schedules

	Assumptions	Analysis	**Alternate possibility** Do not require Firm Contingent tagging for wind participating in Customer Supplied Generation Imbalance (CSGI):
	1. All tags are required to be firm contingent. 2. 20% will sink in the BPA BAA 3. 33% capacity factor	1. Amount not sinking in BPA BAA: 80% of 5127 MW = 4102 MW 2. Average output (33% capacity factor) = 1354 MW 3. 5% of the output (contingency reserve held for wind) = 68 MW.	1. Amount of wind in CSGI: =1644 MW 2. Amount tagged firm contingent = 5127 – 1644 = 3483 3. Amount not sinking in BPA BAA: 80% of 3483 MW = 2787 MW 4. Average output (33% capacity factor) = 920 MW 5. 5% of the output (contingency reserve held for wind) = 46 MW
Preliminary Result	Preliminary analysis suggests a range of 46 MW to 68 MW reduction in our operating reserve obligation.		

Note: Firm Contingent Energy will not affect our balancing reserve held for the FY 2012-2013 rate period.

Operating Reserves Forecast Assumptions for the Initial Proposal

- Very Preliminary Operating Reserve Forecast

		A	B	C
		5x7	3x3	Mix
		FY12-13 Rate Period Average (MWs)		
1	Operating Reserve, net of self and third-party supply, provided by FCRPS (MW)	532	422	451
2	Firm Contingent Tag (MW)	-46 to -68	-46 to -68	-46 to -68
3	Net Amount (MW) (lines 1-2)	486 to 464	376 to 354	405 to 383

- Assumptions:
  - Current self-supply and third-party supply elections are reflected above (May 2011 is the next election date per Transmission Services' Business Practice.).
  - Effective FY 2012, self-supply and third-party supply from Slice ends.
  - Mix is six months at 5x7 and 18 months at 3x3.
- We welcome your input on assumptions to be made for the Initial Proposal regarding the Operating Reserve forecast amount.

Generation Input Costs for Operating Reserves

- WP-10 Cost Allocation Methodology for Operating Reserves
- Embedded Costs
- Variable Costs
- Total Reserve Costs = Embedded + Variable

Overview of WP-10 Embedded Cost Allocation Methodology

- Method used for Operating Reserves
  - Calculate the costs associated with selected hydro projects and divide those costs by the average annual capacity amount of those same hydro projects.

WP-10 Embedded Cost Allocation

- In WP-10, BPA used an embedded cost calculation to determine the unit cost of the hydro projects used to provide operating reserves.
  - All regulated hydro and 11 independent hydro projects
  - The numerator included the costs associated with the resources themselves, a share of the Fish & Wildlife Costs, a share of Administration & General expense, and three revenue credits.
  - The denominator used the 120-hour measure of capacity for the specified resources under 1958 water (average).
  - Same method as used for Wind Balancing Service, except wind balancing is based on Big 10 hydro only.

Variable Cost of Reserves

- Goal is to cost reserves in a robust fashion to capture the impact of carrying and deploying reserves.
- General method is to model the dispatch of controller projects over the 70-year data set for each month.

1. Start with the rate case model run for generation allocation (HYDSIM).

2. Make unit commitment and dispatch calculation to meet generation request and reserves obligation while minimizing water consumption.

3. Deploy reserves in response to an error signal.

Variable Cost of Reserves

- Costs associated with setting up the system to stand ready and respond to reserve need.
- All reserves are referred to as “inc” or “dec” obligations.
  - Inc Reserve: ability to increase generation in order to maintain load-resource balance in the BAA.
  - Dec Reserve: There are no dec reserves for Operating Reserves.
- All costs are operations related and do not include items such as O&M.
- There are two broad categories of cost:
  1. Stand Ready
  2. Deployment

Variable Cost of Reserves

- Stand ready: Those costs associated with making the reserve available such that the system is capable of instantaneously maintaining load-resource balance 99.5% of the time. Stand ready costs consist of:

  1. Energy shift
  2. Efficiency loss
  3. Base cycling loss
  4. Spill Loss

- For each stand ready component, the impact of providing non-spinning and spinning reserves by month and diurnal period is identified (note: Spill is loss associated with only non-spinning and spinning reserves).

Variable Cost of Reserves

- Deployment: Those costs associated with using the reserve in response to the system's need to maintain load-resource balance. Deployment costs consist of the following:
  1. Response losses
  2. Incremental cycling loss
  3. Incremental spill
- For each deployment component, the impact of deploying inc reserves by month and diurnal period is identified.

Notable Changes in Variable Cost Modeling

- Modeling all unit families at each controller project: this allows more flexibility by taking advantage of the different operating characteristics of different unit families at a given project.
- Modeling each minute of each month during deployment: this is more precise than the simulation previously used and explicitly captures the unit cycling events.
- Explicit input of an error signal: rather than simulate an error to be balanced, actual error signals or a user generated signal is explicitly read into the model on a minute time-step for each month.
- More output data: the model will produce more and easier to read output.
- Generally more user friendly.

FORECAST OF INSTALLED WIND CAPACITY

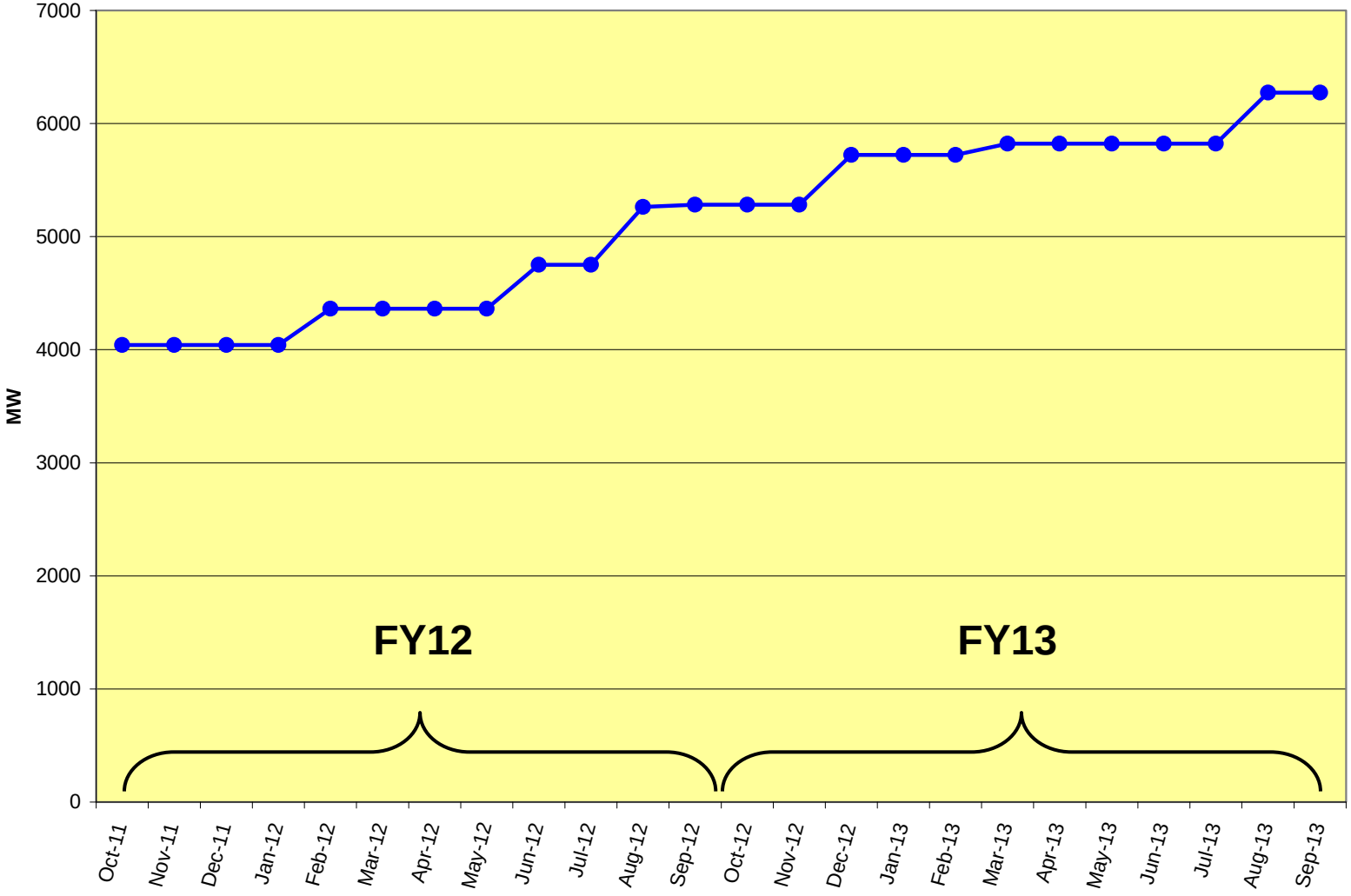
Forecast of Installed Wind Capacity

- For the FY 2012-2013 rate period, BPA is preparing a list of existing and forecast wind projects including MW and location.
- The list is organized by the month and year; forecast is for expected commercial service.
- To forecast on-line dates, BPA staff assesses the status of various projects in BPA's interconnection queue to develop the forecast. The assessment considers, among other things:
  1. Study status of each project request. Each project must complete the Large Generator Interconnection Procedures (LGIP) study process, which includes several studies, before an interconnection date can be offered. Studies take ~2 years to complete.
  2. BPA environmental review (National Environmental Policy Act; NEPA) status and interconnection customer permitting process.
  3. Interconnection and network addition requirements – construction time for interconnection and any major system upgrades.

Forecast of Installed Wind Capacity

- Forecast parameters (continued):
  4. BPA Work Plan/Work Load planning. BPA has a two-year work plan and requires projects to be committed for funding before BPA can offer an interconnection date.
  5. Information received in direct discussions with each developer about their plans (project financing, turbine ordering, permitting process, power purchase agreements) is taken into account for the forecast.
  6. Executed engineering and procurement (E&P) agreement. The signed and funded E&P allows BPA to provide a firm interconnection schedule and to begin work on the project.
  7. The execution of a Large Generator Interconnection Agreement (LGIA). This usually occurs late in the process, often the last year before energization.
- The forecast shows the total MW by month.

Forecast of Installed Wind Capacity in the BPA BAA



Forecast of Installed Wind Capacity in the BPA BAA

FY12	
DATE	INST CAP
10/1/2011	4042
11/1/2011	4042
12/1/2011	4042
1/1/2012	4042
2/1/2012	4362
3/1/2012	4362
4/1/2012	4362
5/1/2012	4362
6/1/2012	4752
7/1/2012	4752
8/1/2012	5262
9/1/2012	5282

FY13	
DATE	INST CAP
10/1/2012	5282
11/1/2012	5282
12/1/2012	5723
1/1/2013	5723
2/1/2013	5723
3/1/2013	5823
4/1/2013	5823
5/1/2013	5823
6/1/2013	5823
7/1/2013	5823
8/1/2013	6273
9/1/2013	6273

- FY 2012-2013 rate period average is 5127 MW.
- Note: BPA is forecasting 4042 MW (which includes 34 MW of small wind) at the end of FY 2011 based on the most recent construction schedules for commercial operation.

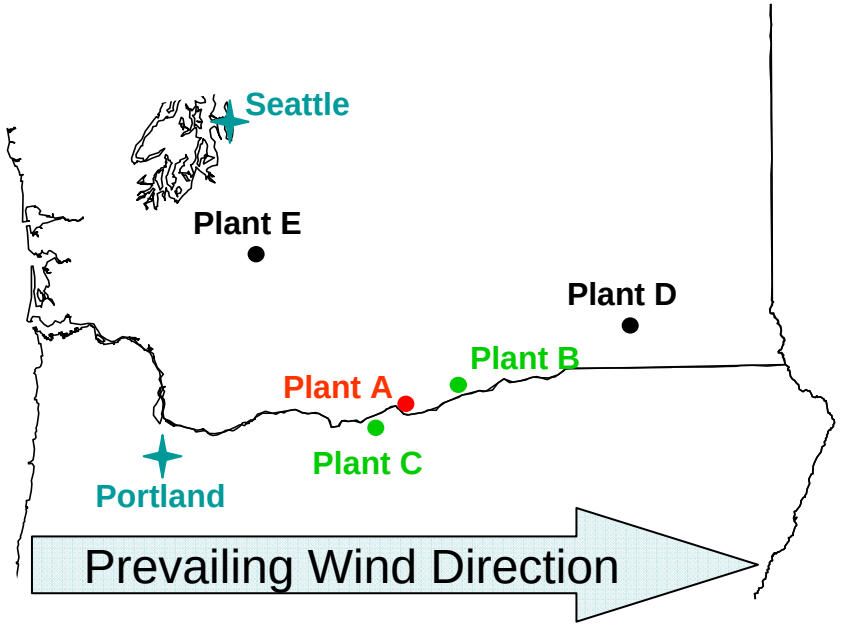
WIND SCALING METHODOLOGY

Wind Scaling Methodology Review

- To calculate the balancing requirements for planned wind generation for the BPA-10 Rate Case, BPA contracted with a wind forecasting company to provide the prevalent wind patterns across the BPA BAA using data from a MesoScale model created by the wind forecasting company.

- The analysis involved computing time leads and lags for planned wind from existing wind that were multiplied by installed and planned capacity to derive estimated output of wind farms.

Wind Scaling Methodology Review



- For example, if a planned 100 MW wind farm (A) had a 20-minute lead before an existing 200 MW wind farm (B) and a 10-minute lag after an existing 50 MW wind farm (C), and both B and C were equally indicative of the output of A, A would have the following estimated generation for any minute:

  A = (100/200)*(B+20minutes)*0.5 + (100/50)*(C-10minutes)*0.5

Scaling Methodology Test - Update

- Evaluate the BPA-10 Scaling Methodology Analysis
  - Test Plan: Calculate the generation reserves over one full calendar year for an installed capacity with a group of wind plants modeled as either their actual generation (base case) or their virtual generation (test case).
- Parameters and assumptions were set the same as for the BPA-10 Rate Case, including:
  - The scaling process used to create the virtual wind plants
  - The 30-minute persistence wind forecasting metric
  - The allocation of reserves between load and wind
- Use calendar year 2009 as the test period
- Simulations for analysis were run at 2,254 MW of installed capacity with:
  - 773 MW modeled using only actual output (online prior to 2007)
  - 583 MW modeled using only virtual output (online in 2009)
  - 898 MW modeled using actual (base case) and virtual (test case) outputs (online in 2007 and 2008)

Scaling Methodology Test – Analysis Update

- Difference since last published results is due to the correction of an error in the calculations for the Base Case and cleanup of missing data in the Load.
- Generation Reserves for Load net Wind on the entire 2,254 MW of Wind

GENERATION RESERVES (MW) - CY2009					
		Regulation	Load Following	Generation Imbalance	Total Reserves
BASE CASE					
BASE TOTAL	INC	82.6 MW	242.6 MW	283.2 MW	608.5 MW
	DEC	-85.7 MW	-248.5 MW	-398.7 MW	-732.9 MW
BASE LOAD	INC	55.7 MW	90.4 MW	-30.1 MW	116 MW
	DEC	-57.8 MW	-92.6 MW	18.4 MW	-132 MW
BASE WIND	INC	27 MW	152.2 MW	313.3 MW	492.5 MW
	DEC	-28 MW	-155.9 MW	-417.1 MW	-601 MW
TEST CASE with BPA-10 RATE CASE VIRTUAL WIND PLANTS					
TEST TOTAL	INC	81.7 MW	239.6 MW	283.6 MW	604.9 MW
	DEC	-84.5 MW	-246 MW	-405.6 MW	-736.1 MW
TEST LOAD	INC	57.7 MW	91.5 MW	-30.8 MW	118.4 MW
	DEC	-59.7 MW	-94 MW	18.4 MW	-135.3 MW
TEST WIND	INC	24 MW	148 MW	314.5 MW	486.5 MW
	DEC	-24.8 MW	-152 MW	-424 MW	-600.8 MW

Scaling Methodology Test – Analysis Update

- The Total Reserves are less than 0.6% error difference between the Test Case and the Base Case using the BPA-10 Rate Case Scaling Methodology.

- Reserve Errors for Load net Wind on the entire 2,254 MW of Wind

MW ERROR (TEST CASE - BASE CASE)					
		Regulation	Load Following	Generation Imbalance	Total Reserves
TOTAL	INC	-0.9 MW	-3.1 MW	0.4 MW	-3.6 MW (-0.6%)
	DEC	-1.2 MW	-2.5 MW	6.9 MW	3.2 MW (0.4%)
LOAD	INC	2.1 MW	1.2 MW	-0.8 MW	2.5 MW (2.1%)
	DEC	1.9 MW	1.4 MW	0 MW	3.3 MW (2.5%)
WIND	INC	-3 MW	-4.2 MW	1.2 MW	-6 MW (-1.2%)
	DEC	-3.2 MW	-3.9 MW	7 MW	-0.1 MW (0%)

Positive quantity indicates test case predicted more than base case.
Negative quantity indicates test case predicted less than base case.
% error = MW error / base case amount

Scaling Methodology Test – Analysis Update

- Generation Reserves for 898 MW of Virtual Wind ONLY

GENERATION RESERVES (MW) - CY2009					
		Regulation	Load Following	Generation Imbalance	Total Reserves
BASE CASE					
BASE WIND	INC	26.4 MW	85.1 MW	157.8 MW	269.3 MW
	DEC	-26.7 MW	-84.9 MW	-224.5 MW	-336.1 MW
TEST CASE with BPA-10 RATE CASE VIRTUAL WIND PLANTS					
TEST WIND	INC	26.4 MW	84.1 MW	164.7 MW	275.2 MW
	DEC	-26.2 MW	-86.4 MW	-228.9 MW	-341.5 MW

- Reserve Errors for 898 MW of Virtual Wind ONLY

MW ERROR (TEST CASE - BASE CASE)					
		Regulation	Load Following	Generation Imbalance	Total Reserves
WIND	INC	0.1 MW	-1 MW	6.9 MW	6 MW (2.2%)
	DEC	-0.5 MW	1.5 MW	4.3 MW	5.4 MW (1.6%)

Positive quantity indicates test case predicted more than base case.
Negative quantity indicates test case predicted less than base case.
% error = MW error / base case amount

Moving Forward with the Scaling Methodology

- BPA continues to enhance the BPA-10 Scaling Methodology
  - Refine correlation factors
  - Increase resolution of time offsets

- The results of the evaluation of the BPA-10 Scaling Methodology indicate that the methodology is accurate and produces acceptable results for ratemaking purposes.

- For BPA-12, our primary focus will be on the implementation of the BPA-10 Scaling Methodology, but we will continue to explore other methods after this rate case.

Next Steps

- **<u>15 July 2010</u>:**
  - Reserve Forecast
    - Other Resource Types
    - Wind/Load Split
  - Formula Rate Design Overview (cost allocation and rate design)

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.
  - 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.