# Joint Operating Committee

September 24, 2008

# Joint Operating Committee

| Time | Topic |
|---|---|
| 9:00 - 9:15 | Introductions (Elliot Mainzer) |
| 9:15 - 9:45 | Purpose for JOC Meeting, Article 29 (Steve Enyeart, Bart McManus, Matt Perkins) |
| 9:45 - 10:00 | Role Call of Official Designates and Alternate Representatives |
| 10:00 – 10:45 | Discussion of Initial DSO, Dispatch procedures for 'Limit to Schedule'<br>– NERC/ WECC Reliability Requirement Discussion<br>– Reason for Call – Limited Balancing Reserves, other Reliability Issues<br>– 'Limit to Schedule', GOp need to know Hourly Schedule<br>– Verification of GOp contacts |
| 10:45 – 11:00 | Break |
| 11:00 – 12:00 | Automation of 'Limit to Schedule' Phase 2 Implementation<br>– Target – Operational by March 1 , 2009 – Spring Runoff Issue<br>– BPA signals/data (from SCADA RTU) at each Wind Project<br>– Expected data from GOp: Reply signal and MW Limit Response<br>– Interface Issues |
| 12:00 – 1:00 | Lunch |
| 1:00 – 2:00 | Future Data requirements for Feed Forward AGC<br>– Overview of FF-AGC<br>– Status of FF-AGC Development<br>– GOp Control Center (Encrypted VPN - secure internet)<br>– Plant Data Requirements<br>– Historical Data Requirements – Needed Now |
| 2:00 – 2:45 | Forecast Issues / Impact on Balancing Reserves |
| 2:45 – 3:00 | Wrap-up/Next Steps |

# “Limit to Schedule” Overview

- Wind output control required for operational reliability.  This includes:
  - Limited system capability (minimum stream flows, low water periods, etc)
  - Biop issues placing limits on operational flexibility
  - Cumulative effect of large wind ramps on reserves ( and Tail events)
  - Other reliability issues
- For 2008 we are relying on Dispatch to call wind projects.  Would limit generation to hourly schedule.
- Target 3/31/2009 is to have SCADA signal to each wind plant to impose ‘Limit to Schedule’.
- Ramp Limiting may be considered later as the FF AGC system is developed.

# Applicable Reliability Standards – WECC / NERC

The following Reliability Standards form the basis for the Dispatch Standing Order (DSO) and wind generation limits:

- **BAL – 005-0 Automatic Generation Control, Section R2.**
  - Each Balancing Authority shall maintain Regulating Reserves that can be controlled by AGC to meet the Control Performance Standard.
- **IRO – 001-1 Reliability Coordination - Responsibilities and Authorities, Section R8**.
  - Transmission Operators, Balancing Authorities, Generator Operators, … shall comply with Reliability Coordinator directives unless such actions would violate safety, equipment, or regulatory or statutory requirements. Under these circumstances, the Transmission Operator, Balancing Authority, Generator Operator, … shall immediately inform the Reliability Coordinator of the inability to perform the directive so that the Reliability Coordinator may implement alternate remedial actions.
- **TOP-001-1 Reliability Responsibilities and Authorities, Section R3.**
  - Each Transmission Operator, Balancing Authority, and Generator Operator <u>shall comply with reliability directives issued by the Reliability Coordinator</u>, and each Balancing Authority and Generator Operator <u>shall comply with reliability directives issued by the Transmission Operator</u>, unless such actions would violate safety, equipment, regulatory or statutory requirements. Under these circumstances the Transmission Operator, Balancing Authority or Generator Operator shall immediately inform the Reliability Coordinator or Transmission Operator of the inability to perform the directive so that the Reliability Coordinator or Transmission Operator can implement alternate remedial actions.

# Applicable Reliability Standards – WECC / NERC (Cont.)

- **TOP-001-1 Reliability Responsibilities and Authorities, Section R6.**
  - Each Transmission Operator, Balancing Authority, and Generator Operator shall render all available emergency assistance to others as requested, provided that the requesting entity has implemented its comparable emergency procedures, unless such actions would violate safety, equipment, or regulatory or statutory requirements.
- **TOP-006-1 Monitoring System Conditions, Section R5.**
  - Each Reliability Coordinator, Transmission Operator, and Balancing Authority <u>shall use monitoring equipment</u> to bring to the attention of operating personnel <u>important deviations in operating conditions</u> and to indicate, if appropriate, <u>the need for corrective action.</u>

# “Limit to Schedule” 2008 DSO Procedures

- Until further notice, BPA Dispatch will be calling each Wind Plant operator, when necessary.
- Plant Operator:
  - Needs to know submitted Generation schedules
  - Must limit generation to hourly schedule within 10 minutes
  - To stay on hourly schedules until BPA Dispatch recalls order
- Failure to follow a TOp order must be reported to NERC/WECC
- BPA may also take other actions, for failure to respond

# Wind Plant Operators Contact List

- BPA has contacted each Wind Plant operator for the official contact.
- Plant Operators – Please present any changes in contact information at this time:
  - Let us know of a need to revise
  - BPA contacts:
    - **Operational Primary**: Dittmer Dispatch

      Phone: (360) 418-2280 or 418-2281
      Fax: (360) 418-2938
    - **Alternate & Local Subgrid**: Munro Dispatch

      Phone: (509) 465-1820
      Fax: (503) 219-9009

# “Limit to Schedule” 2009 Procedures

- BPA AGC Dispatch desk will initiate the ‘Limit to Schedule’ order when Balancing reserves fall below reliability limits
  - The signal will be sent to all Plant operators (via SCADA or ?)
  - Signal will be sent continuously until the reliability issue has been relieved.
  - BPA Dispatch will expect the wind project to adjust output within 10 minutes. (Being lower is not an issue at this time.)
  - If the signal crosses into another hour, then the output must be adjusted to the new hour schedule in effect.
- Dispatch desk will monitor for each Wind Project:
  - Actual MW value
  - Received Plant operator MW set point (submitted schedule)
  - Copy of MW schedule from schedule desk

# “Limit to Schedule” RTU Points

- Due to the increasing number of wind projects, BPA will automate the Dispatch Callout in 2009
- Most Wind Projects have a BPA RTU at the Collector Sub
- BPA will provide the following at each RTU:
  - **‘Limit to Schedule’ Trip signal (Digital Out)**
  - **Acknowledgment from Plant operator of received signal (1 minute response time) (Digital In)**
  - **MW Schedule (Continuously Sent) (Analog In)**
- The MW schedule value provided by the wind project should be continuous and is required information to be available to the Plant Operator
- BPA Dispatch will expect the wind farm to be at schedule within 5 minutes.

| No. | Wind Project/RTU Location | Owner | MW |
|---|---|---|---|
| 1 | Big Horn Wind Project / Big Horn sub | Iberdrola | 200 |
| 2 | White Creek Wind / White Creek sub | LMEC | 204 |
| 3 | Klondike III @ John Day (Will add RTU @ KIII) | Iberdrola | 195 |
| 4 | Leaning Juniper #1 @ Jones Canyon sub | PacifiCorp | 100 |
| 5 | Hopkins Ridge / Hopkins Ridge sub | PSE | 150 |
| 6 | Biglow Canyon @ John Day (will add RTU @ Biglow) | PGE | 125 |
| 7 | Goodnoe Hills / Imrie sub | PacifiCorp | 146 |
| 8 | Klondike III (Webfoot - add RTU @ KIII ) | Iberdrola | 101 |
| 9 | Klondike Phase II / KI-KII Control house | Iberdrola | 75 |
| 10 | Klondike Phase I / KI-KII Control house | Iberdrola | 25 |
| 11 | Nine Canyon / Nine Canyon sub | ENW | 50 |
| 12 | Stateline Wind Project / Nine Mile Sub | FP&L | 90 |
| 13 | Condon Wind Project / Condon sub | Seawest | 50 |
| 14 | Pebble Springs (LJ2) @Jones Canyon sub | Iberdrola | 100 |
| 15 | Rattlesnake Road [Arlington Wind] @ Jones Canyon sub | Horizon | 103 |
| 16 | Windy Point Wind PH I / Energizer sub | Windy Point | 113 |
| 17 | Windy Point Wind PH II / Willis sub | Windy Point | 137 |
| 18 | Willow Creek Wind / Horn Butte sub | Invenergy | 75 |
| 19 | Wheatfield (Arlington Wind) @ Jones Canyon sub | Horizon | 97 |

# “Limit to Schedule” Plant Operator Options

- RTU option discussed above requires Wind Project to provide an interface to the BPA RTU and on to the Wind Project Control Center (WPCC).
- Ultimately BPA wants an ICCP link to the WPCC. Options include:
  - **Develop RTU interface now and convert in the future**
  - **For existing BAA’s – use ICCP link now**
  - **Consider ICCP link now, if time permits**
  - **Concern with location of WPCC and communications options**
- ICCP link can be in the form of GenICCP (BPA protocol), SCADA – ICCP or DNP may be considered.
- RTU option is fall-back position for meeting 3/31/2009 deadline.
- [Discussion on interface issues for Wind Projects]

# Feed-Forward AGC Goals and Benefits

- Make efficient use of generation on AGC (including reduce wear and tear, unit scheduling)
- Reduce total amount of generation set aside for AGC by anticipating needs.
- Provide mechanism to initiate limits on Wind generation, when needed for reliability.
- Future: Provide output to adjust FCRPS generation schedules (mid-hour adjustment), reducing AGC units on stand-by or set aside for AGC.
- Future: Provide output to change interchange schedules (mid-hour adjustment), shifting Balancing requirements to loads served in other BAA's.

# Status of FF AGC Development

- R & D project (3-Tier) is underway to develop within-hour wind generation forecasts enhanced with weather and regional monitoring of wind generation.
- 3-Tier to provide software to create ‘Forecasts’ every 5 minutes up to 1 hour out (12 x 5 minute updated every 5 minutes).
- Software project to start in October to revise AGC software.
- Target late 2009 to have Pilot Project implemented working with one or more wind farms.
- Will require Data from each wind farm when fully implemented.

# Wind Project Data Requirements

- Obtain up to 2 years data (MW, MVAr, wind speed and direction) from each wind project
- Develop data link for each wind project (Encrypted VPN - Secure Internet)
- Aggregate data at each wind project into strings* (4 - 7 WTG's per string),
- Required Data:
  - MW output and Wind speed average values for each 30 seconds
  - Wind direction and units online in string, snapshot every 30 seconds
  - Provide data every 30 seconds to BPA using Internet FTP format (SSH secure)

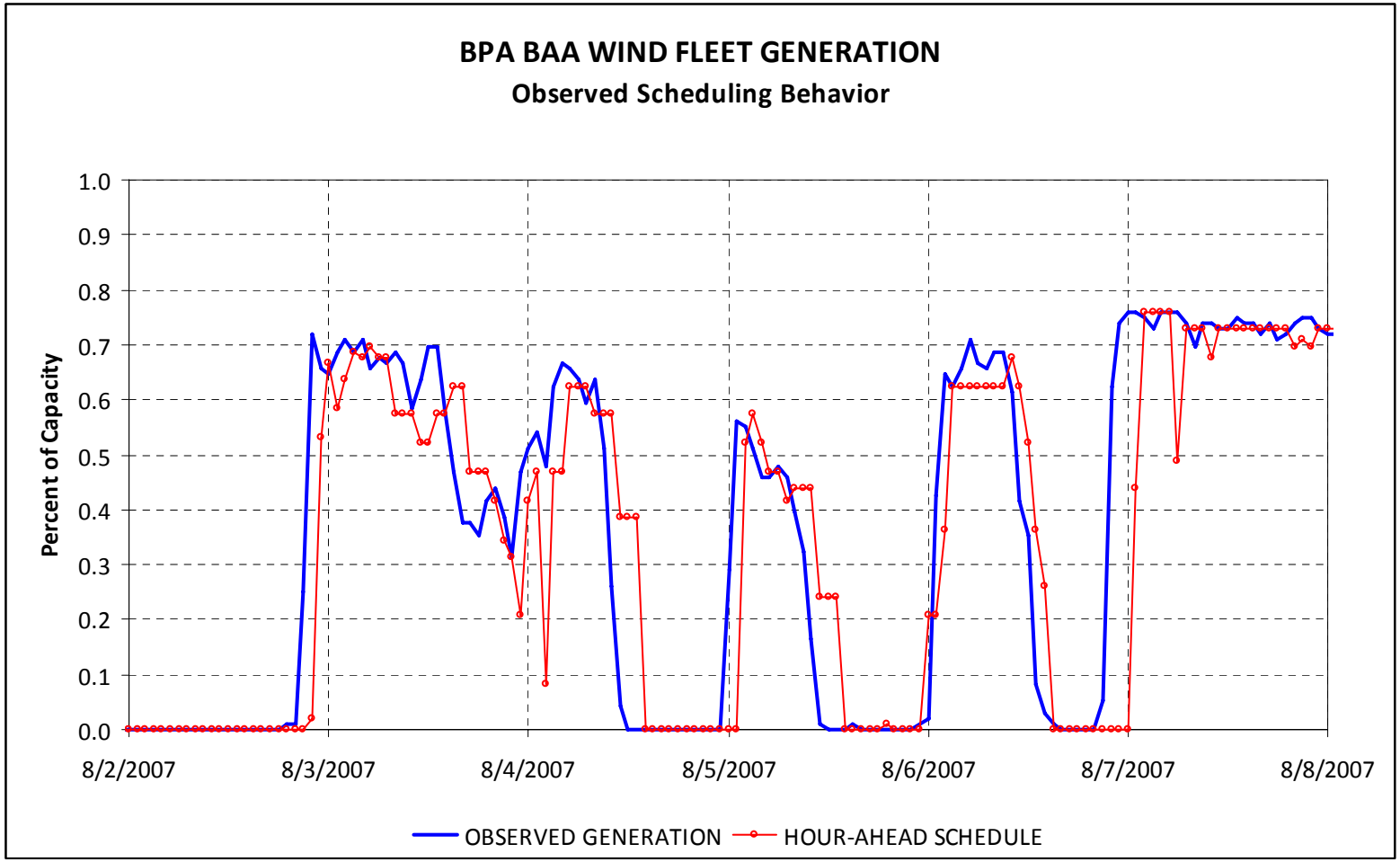
*** String is defined as WTG's in same geographical location within wind farm**

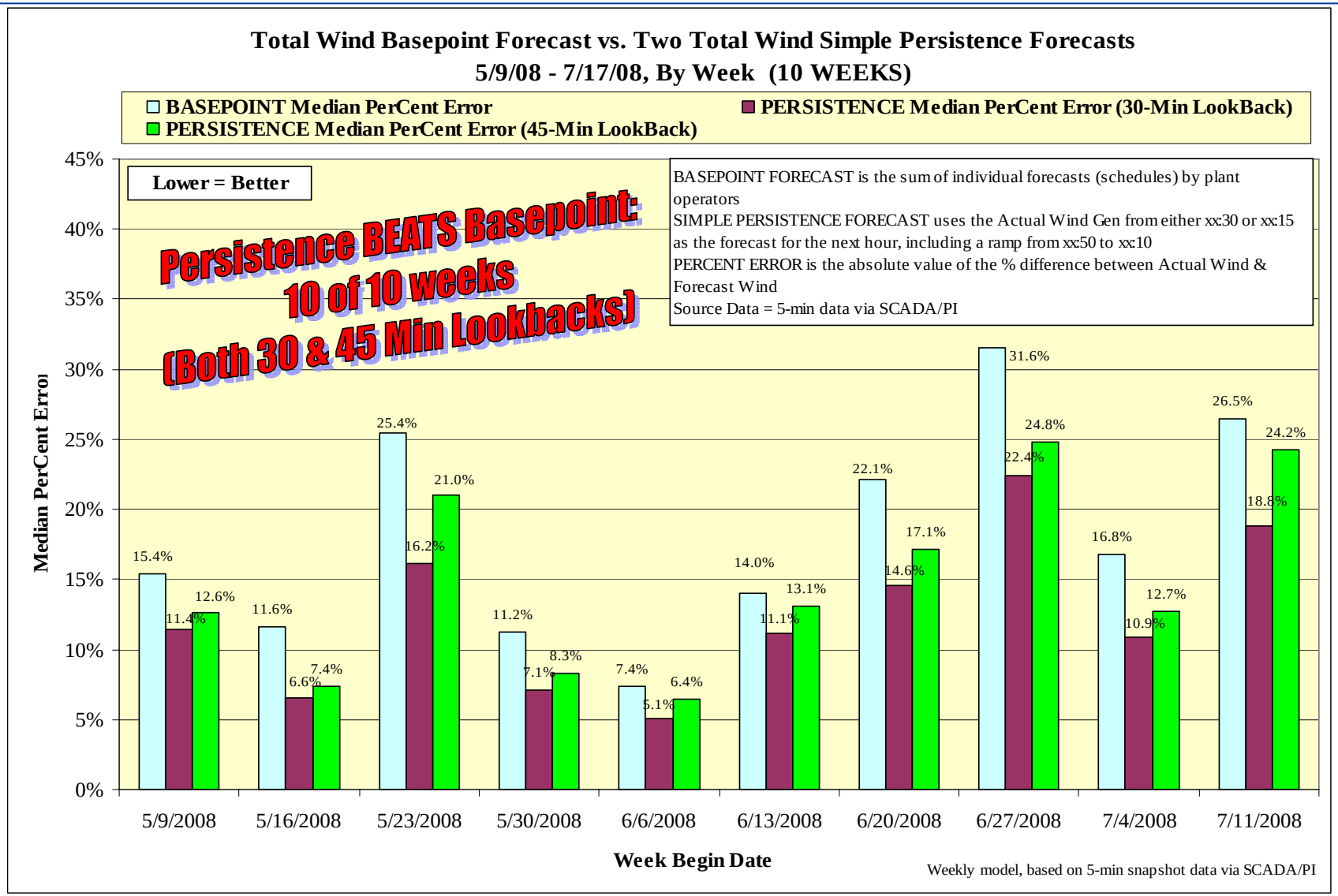
# Scheduling/Forecasting Issues

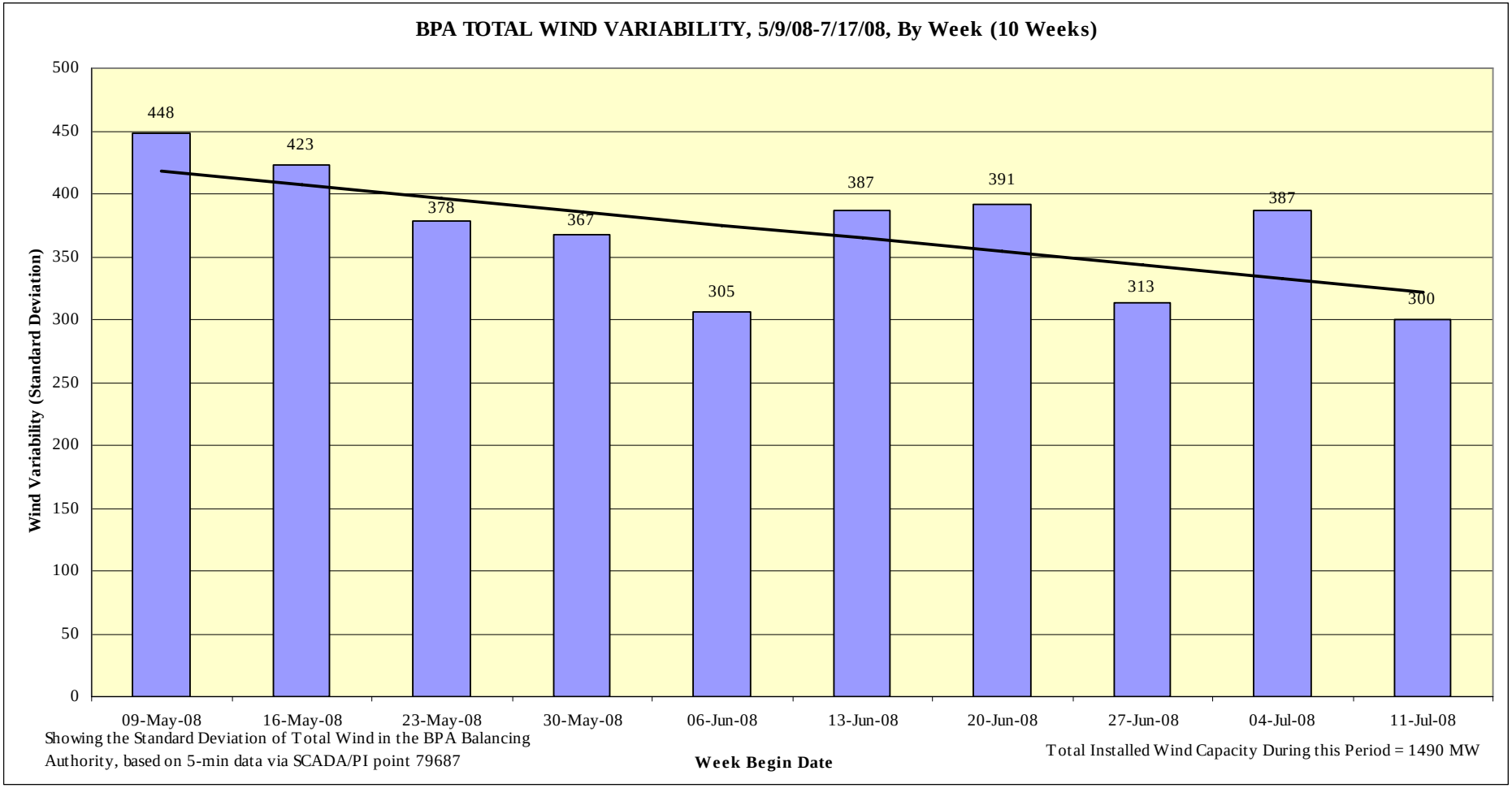
- Wind generation schedules (e.g. hour-ahead forecast generation) exhibit consistent lag behind the observed generation. Highest correlation with observed schedules was a 2-hour lag.
  - This means that whatever the wind generator produces in this hour is normally what is scheduled for two hours out.

# Reserves Forecasting Methodology

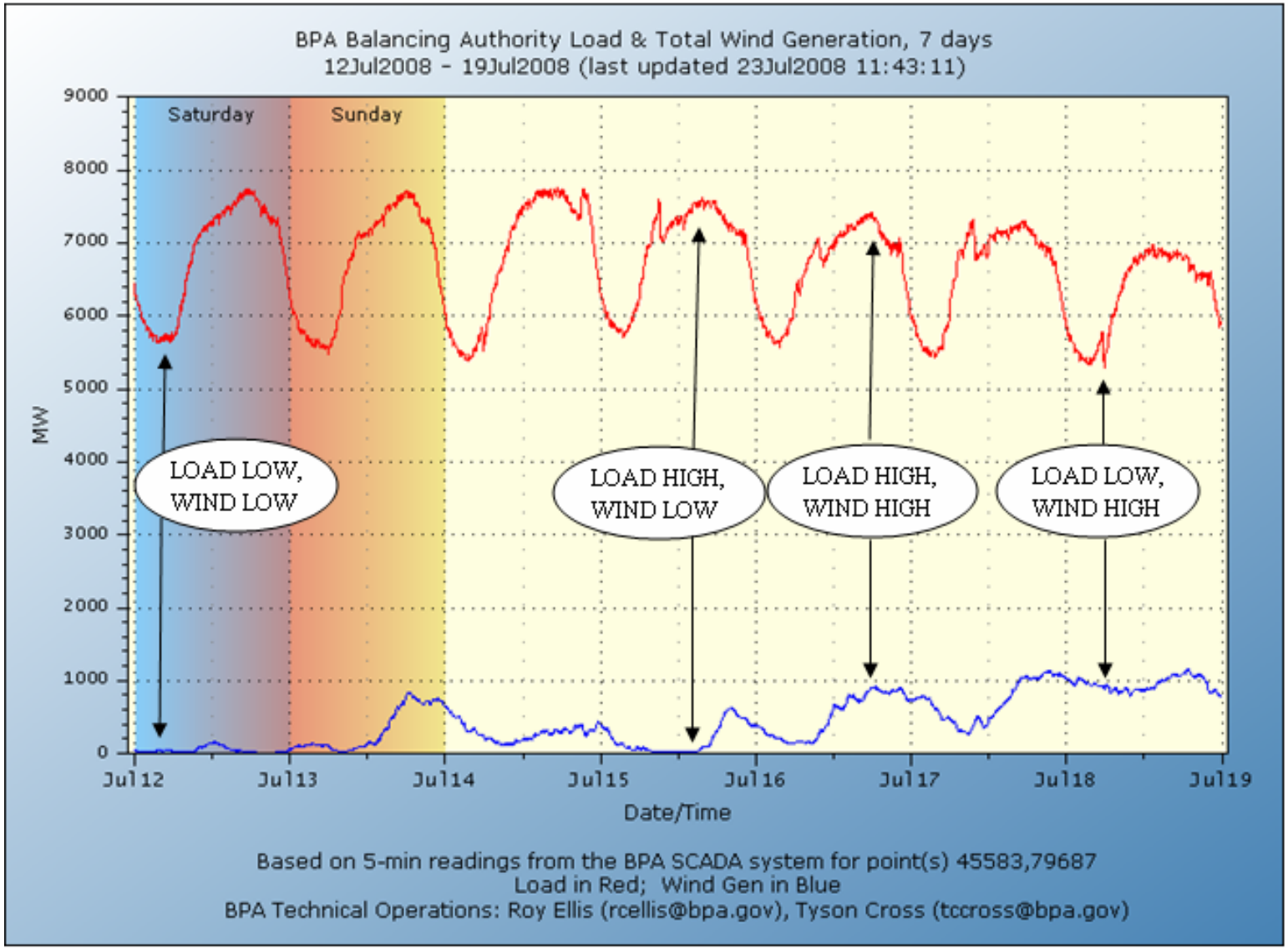
## Estimating Future Wind Forecasts (pp 5-7)

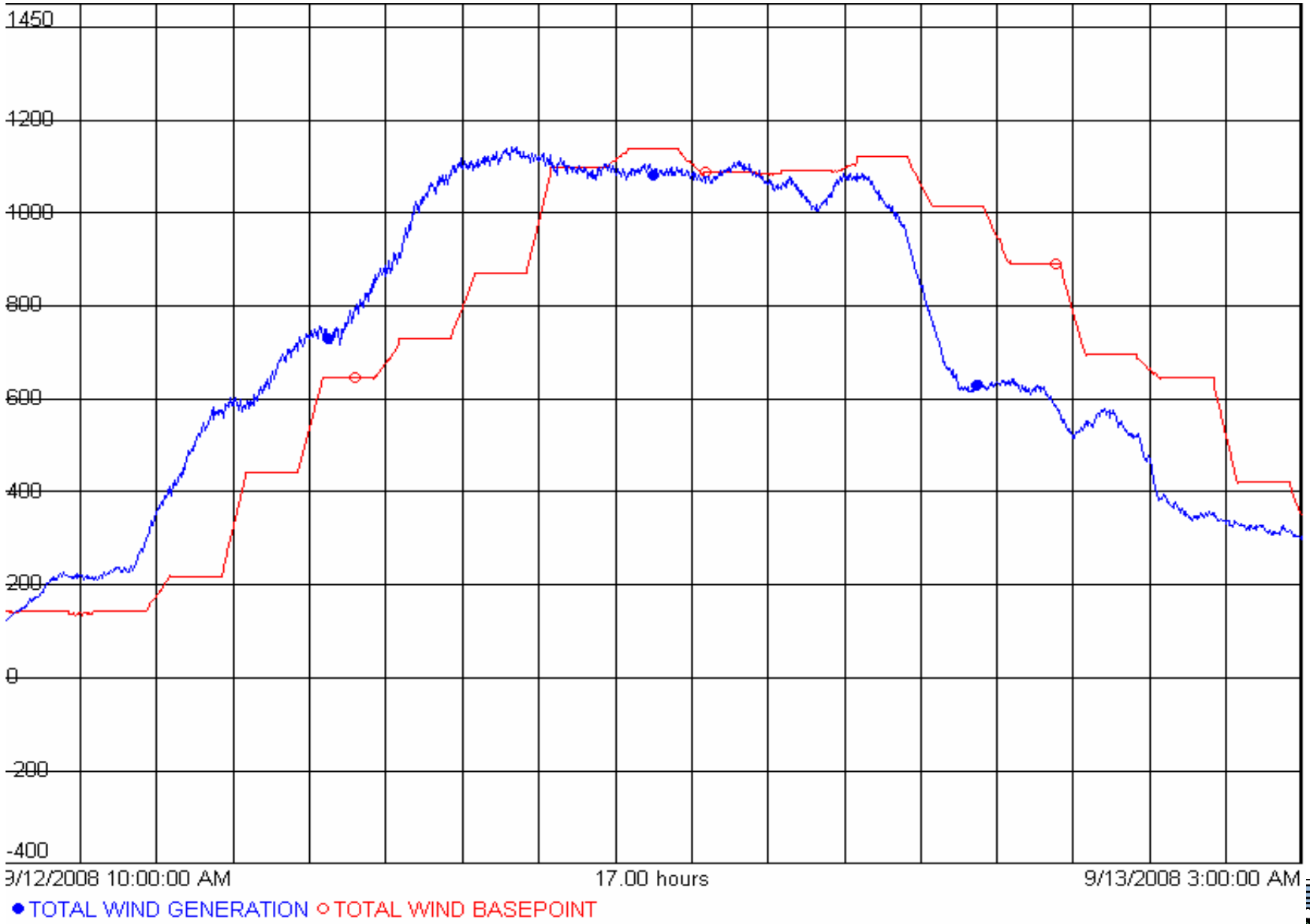



Total Wind Basepoint Forecast vs. Two Total Wind Simple Persistence Forecasts
5/9/08 - 7/17/08, By Week (10 WEEKS)
BASEPOINT Median PerCent Error
PERSISTENCE Median PerCent Error (30-Min LookBack)
PERSISTENCE Median PerCent Error (45-Min LookBack)
Lower = Better
Persistence BEATS Basepoint:
10 of 10 weeks
(Both 30 & 45 Min Lookbacks)
BASEPOINT FORECAST is the sum of individual forecasts (schedules) by plant operators
SIMPLE PERSISTENCE FORECAST uses the Actual Wind Gen from either xx:30 or xx:15 as the forecast for the next hour, including a ramp from xx:50 to xx:10
PERCENT ERROR is the absolute value of the % difference between Actual Wind & Forecast Wind
Source Data = 5-min data via SCADA/PI
Median PerCent Error
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
15.4%
11.4%
12.6%
11.6%
6.6%
7.4%
25.4%
16.2%
21.0%
11.2%
7.1%
8.3%
7.4%
5.1%
6.4%
14.0%
11.1%
13.1%
22.1%
14.6%
17.1%
31.6%
22.4%
24.8%
16.8%
10.9%
12.7%
26.5%
18.8%
24.2%
5/9/2008
5/16/2008
5/23/2008
5/30/2008
6/6/2008
6/13/2008
6/20/2008
6/27/2008
7/4/2008
7/11/2008
Week Begin Date
Weekly model, based on 5-min snapshot data via SCADA/PI


BPA TOTAL WIND VARIABILITY, 5/9/08-7/17/08, By Week (10 Weeks)
Wind Variability (Standard Deviation)
500
450
400
350
300
250
200
150
100
50
0
448
423
378
367
305
387
391
313
387
300
09-May-08
16-May-08
23-May-08
30-May-08
06-Jun-08
13-Jun-08
20-Jun-08
27-Jun-08
04-Jul-08
11-Jul-08
Showing the Standard Deviation of Total Wind in the BPA Balancing Authority, based on 5-min data via SCADA/PI point 79687
Week Begin Date
Total Installed Wind Capacity During this Period = 1490 MW

# Load and Wind Generation are Essentially Random




1450
1200
1000
800
600
400
200
0
-200
-400
9/12/2008 10:00:00 AM
17.00 hours
9/13/2008 3:00:00 AM
TOTAL WIND GENERATION
TOTAL WIND BASEPOINT

# Summary / Recap

- Wind output control is required now for operational reliability.
- Starting in 2009 BPA requires an automated ‘Callout’ process due to large number of Wind Projects.
- SCADA interface to each wind project is initial option and fallback.
- BPA will consider ICCP link now if practical.
- Eventually ICCP link is needed for Feed-Forward AGC data collection.
- Ramp Limiting to reduce GI Capacity may be included later as the FF AGC system is developed.
- Forecasting errors are the largest contributor to the need for Balancing Capacity – Better forecasting is needed.