



Wind Power Operational and Market Report Week of Dec 9 to Dec 15, 2007

Thursday, December 20, 2007

1.0 Purpose

Around the world, interest in wind development as a source of renewable energy continues to grow. In Alberta, wind power is part of the diverse mix of generation sources that supplies the growing electricity demands of Albertans. As the amount of wind power on a system grows, so do the operational challenges.

Wind can start, stop or change at any moment. Today wind power is backed up by coal, gas, hydro generation facilities or the interconnections to BC and Saskatchewan using Alberta's competitive electricity markets.

The purpose of the weekly report is to provide industry with graphs and tables that illustrate aspects such as:

- Wind generation versus system load
- Regional diversity of wind generation
- Wind generation in the energy market
- Wind generation forecasts versus actual wind generation

The forecast information comes from the Wind Power Forecasting Pilot Project. The intent is to capture weekly wind power events and break them down from a forecasting perspective in order to educate AESO stakeholders on the capabilities of wind power forecasting. More information about this project can be found on our website at <http://www.aeso.ca/gridoperations/13825.html>.

The AESO anticipates that this report will continue to improve and any feedback is appreciated and feedback can be emailed to AESO stakeholder relations at stakeholder.relations@aeso.ca.

1.1 Weekly Synopsis

The average capacity factor for wind power this week was at 73.16%. The week was well forecasted by the forecasters in the pilot project. We have also introduced a different means to show the forecast information for this past week in section 6.0 that permits a view of a specific timeframe in the 48 hour forecasts.

2.0 Wind Generation Statistics

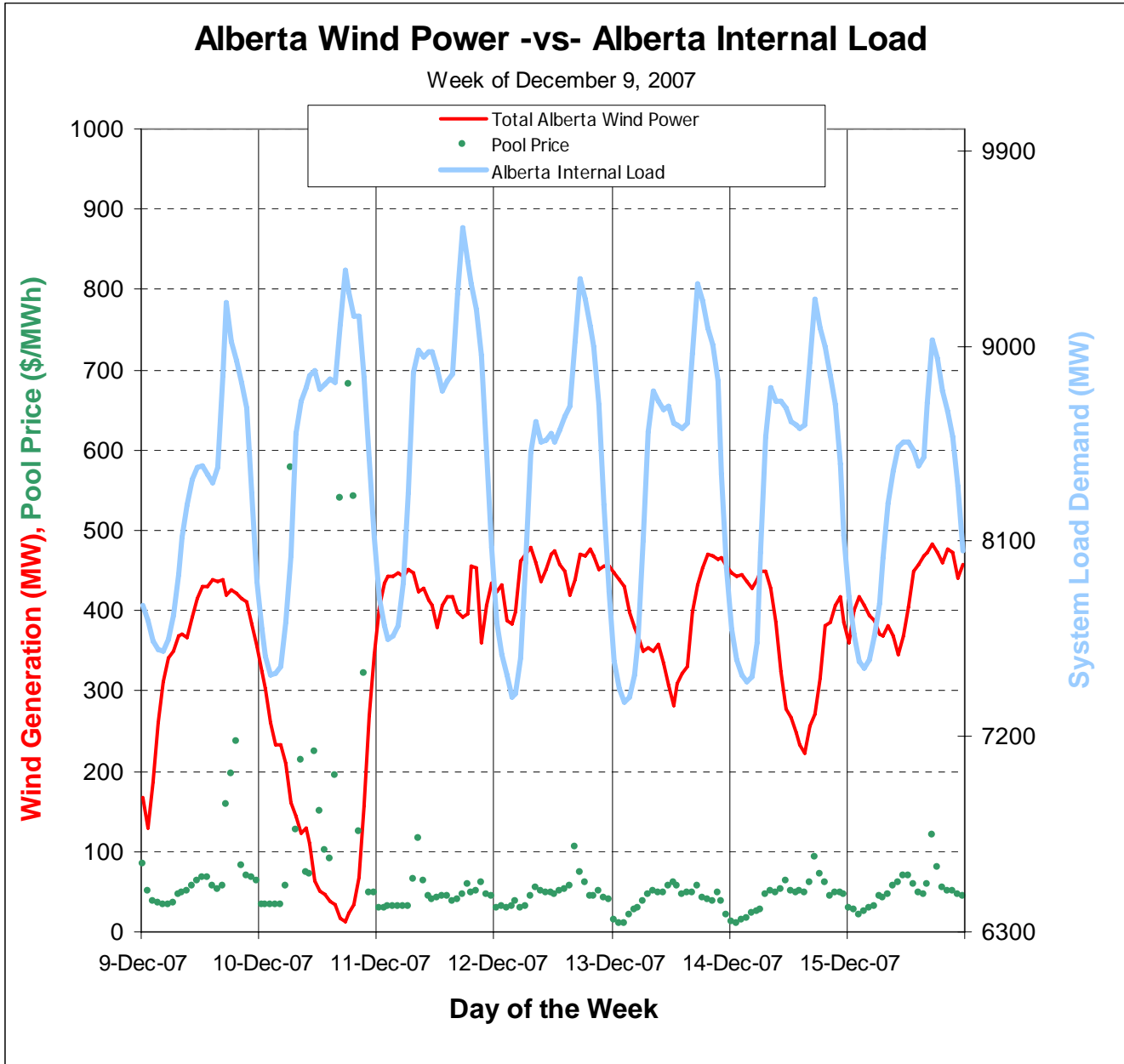
The purpose of this table is to provide daily production statistics as well as any wind power curtailment that occurred. The weekly average capacity factor¹ was 73.16%.

Daily Alberta Wind Generation Statistics										
497MW of Wind Power Currently Operational										
	Wind Generation (MWh/MW) Statistics								Curtailment Statistics	
Date	Average Off-Peak Wind Gen (MWh)	Off-Peak Capacity Factor	Average On-Peak Wind Gen (MWh)	On-Peak Capacity Factor	Average Daily Wind Gen (MWh)	Minimum Wind Generation	Maximum Wind Generation	Average Wind Gen During High Load Hour (MWh)	Number of Hours	Number of Affected Wind Power Facilities
9-Dec-07	263	52.86%	410	82.56%	361	115	451	422		
10-Dec-07	259	52.05%	82	16.58%	141	9	396	18		
11-Dec-07	437	88.02%	412	82.99%	421	309	479	395		
12-Dec-07	427	85.85%	458	92.13%	447	378	487	470		
13-Dec-07	409	82.20%	381	76.74%	390	269	478	443		
14-Dec-07	434	87.42%	329	66.30%	364	213	465	294		
15-Dec-07	399	80.33%	430	86.57%	420	317	489	477		

¹ Capacity factor is determined by averaging the hourly capacity factors which are calculated as: Average Hourly Wind generation/Total installed capacity *100

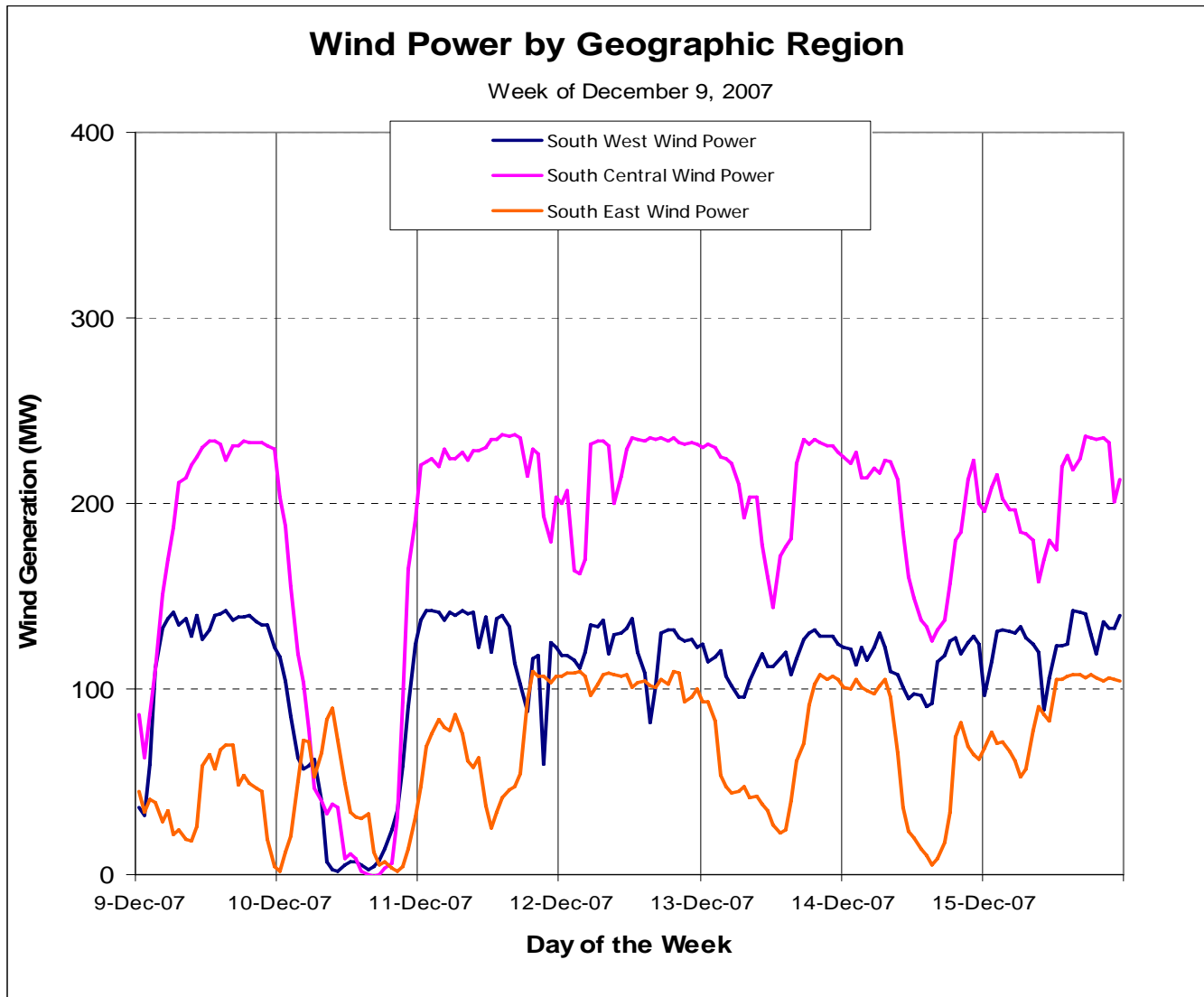
3.0 Wind Generation and System Load

The purpose of the graph is to illustrate how wind power varies with system load and the hourly pool price.



4.0 Wind Diversity in Alberta

The purpose of this graph is to illustrate how wind power varies in the different regions of Alberta.



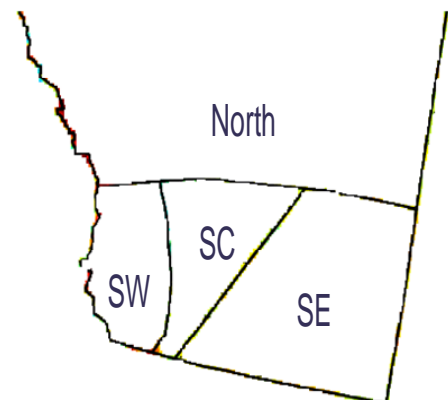
Wind Regions:

South West (SW) Total Installed = 212.3MWs

South Central (SC) Total Installed = 176.2 MWs

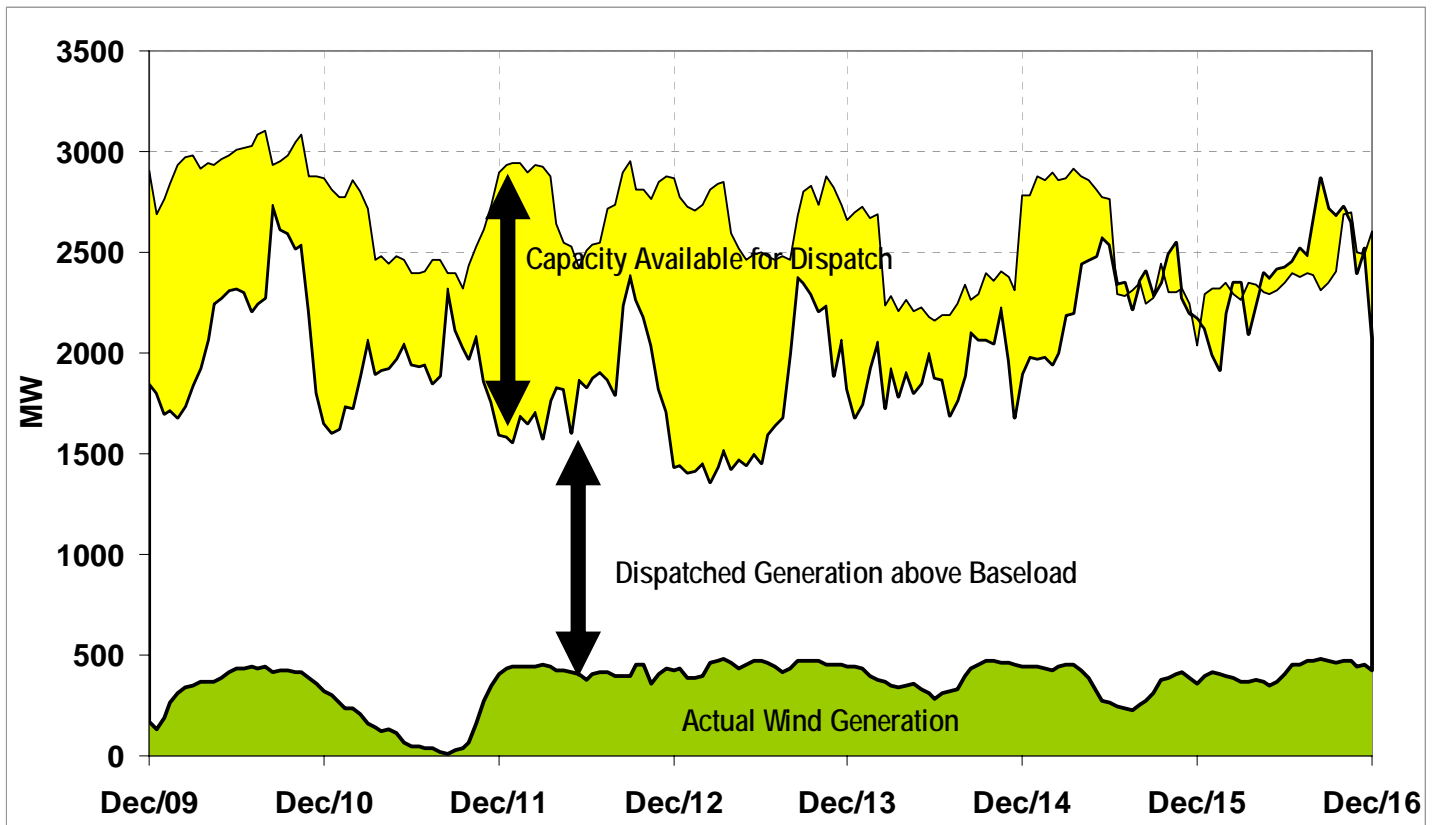
South East (SE) Total Installed = 110 MWs.

There are currently no operational wind facilities in the North



5.0 Generation Supply & Market Dispatch above Baseload Gen (\$0 Offer)

The Purpose of this graph is to demonstrate the variable flexibility that exists in the market place to accommodate wind.



- Based-load generation is the amount of generation from coal, gas or hydro that is either zero dollar offered, Transmission Must Run, small non-dispatchable or behind-the fence industrial generation. This can vary hourly and range between 4500 MW and 6000 MW throughout the year.
- **Note:** The Dispatched Generation above Baseload represents the head room before supply surplus conditions occur.
- **Capacity Available for Dispatch:** Includes unloaded capacity from regulating reserves as well as the amount of offered generation capacity that is not dispatched into the electricity markets.
- **Dispatched Generation above Baseload:** Includes generation produced from the regulating and contingency reserves as well as the amount of non-zero dollar generation dispatched from the energy market merit order.
- **Actual Wind Generation:** The measured amount of all wind generation in Alberta.

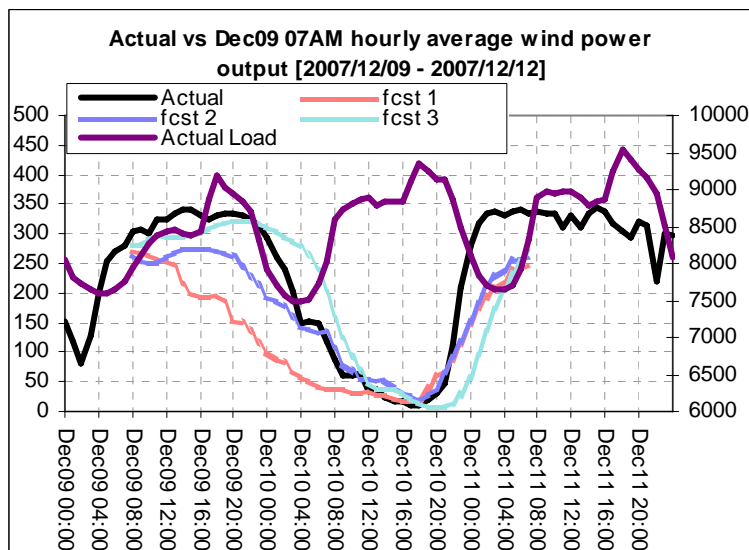
6.0 Wind Power Forecasting Pilot Project

The purpose of this section is to introduce stakeholders to wind power forecasts. The intent is to identify some of the weekly events, and break them down from a forecasting perspective.

Note: the total capacity in the pilot is 350 MW and not the 497 MW currently connected to the Alberta system.

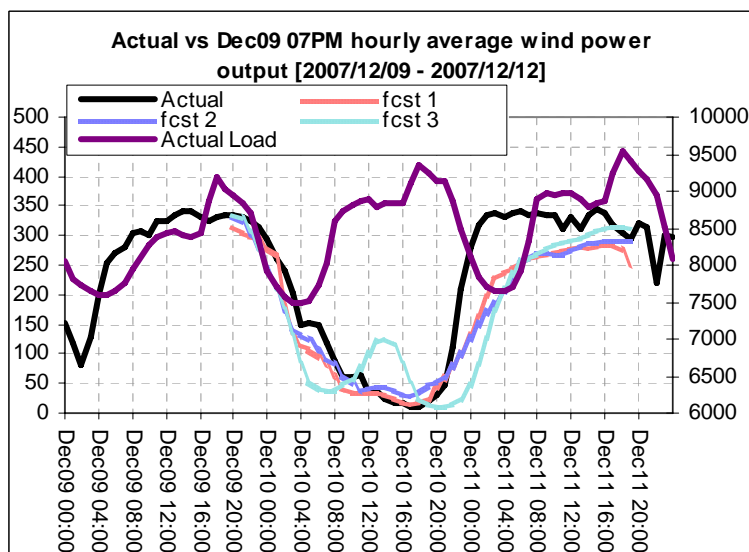
6.1 Event 1

The first event this week was a forecasted wind power ramp down at Dec 10 at 00:00 and a forecasted ramp up of wind power on Dec. 10 at 20:00



These are the forecasts delivered at 7am on Dec 9 for the next 48 hours. The forecasts are 17 hours prior to the ramp down.

All forecasts basically captured the ramp down and ramp up. The key differences are the phase or timing of the forecasts to the actual ramp.

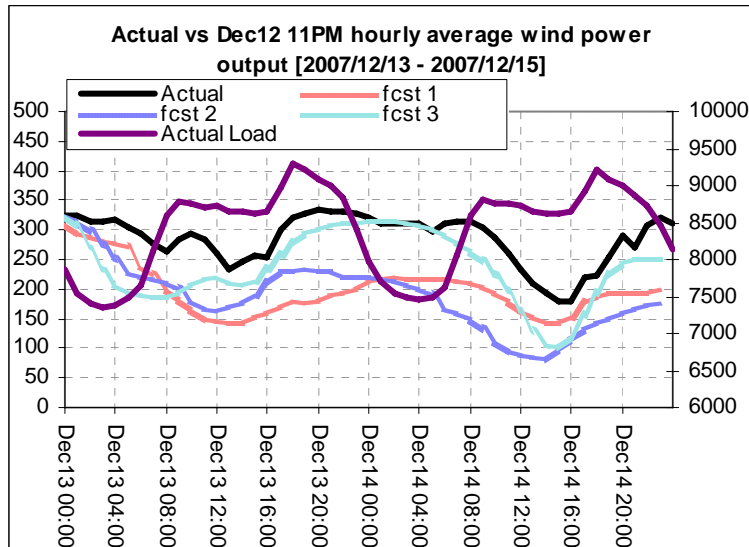


These are the forecasts for the next 48 hrs delivered at 7pm on Dec 9. The forecasts are now 5 hours prior to the ramp down.

All three forecasters have improved the phase error or timing on the ramp down.

6.2 Event 2

The second event covers two days where the wind power sustained higher levels with some smaller ramps up and down.



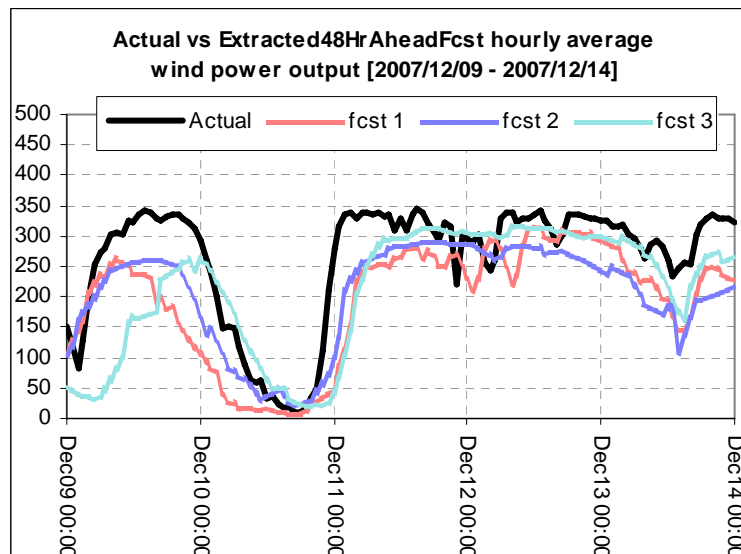
These are the forecasts for the next 48 hrs delivered at 11pm on Dec 12.

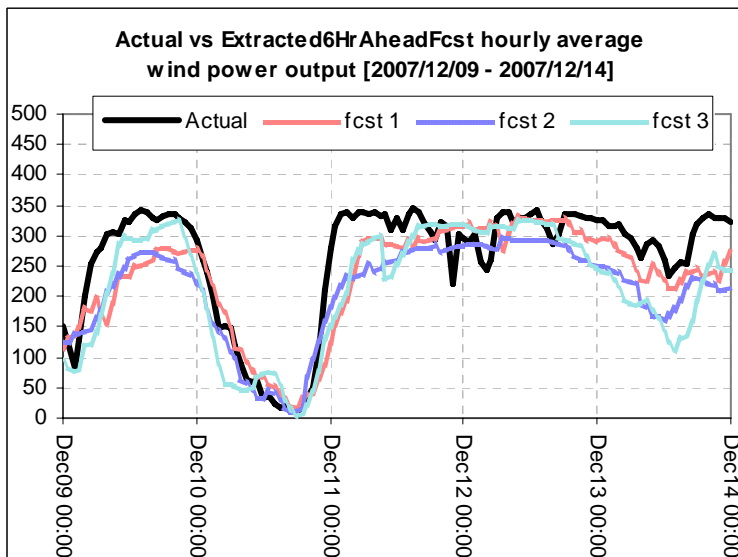
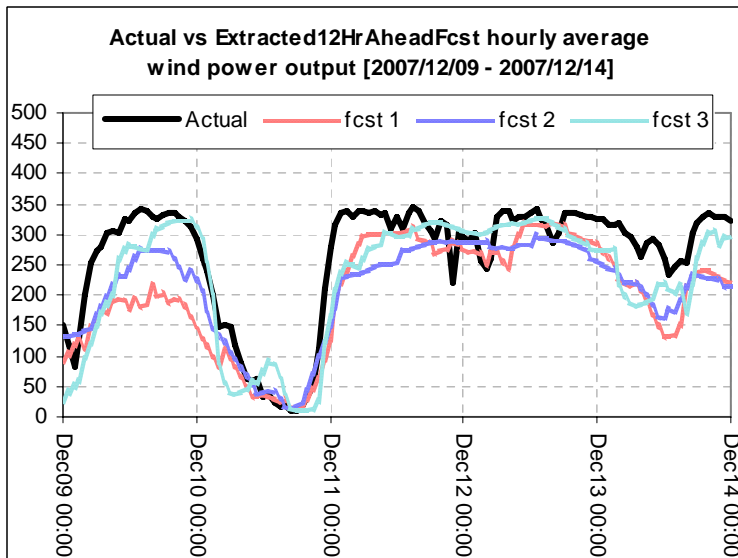
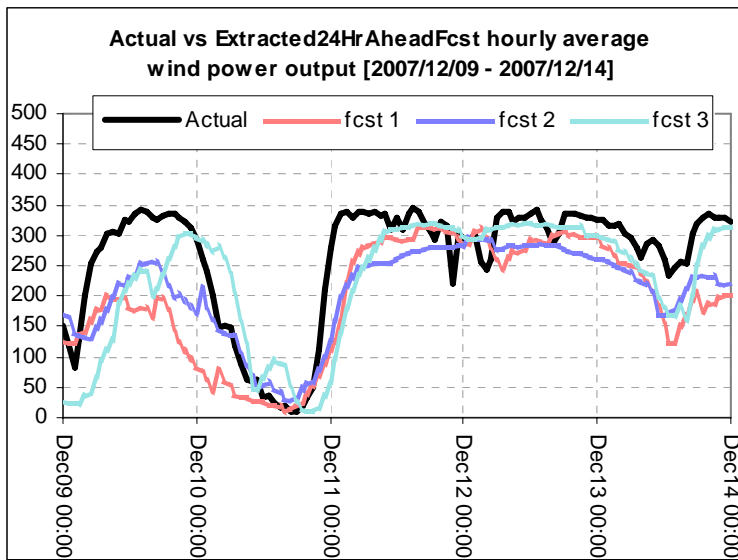
All three forecasters capture the trend well for the next 48 hours.

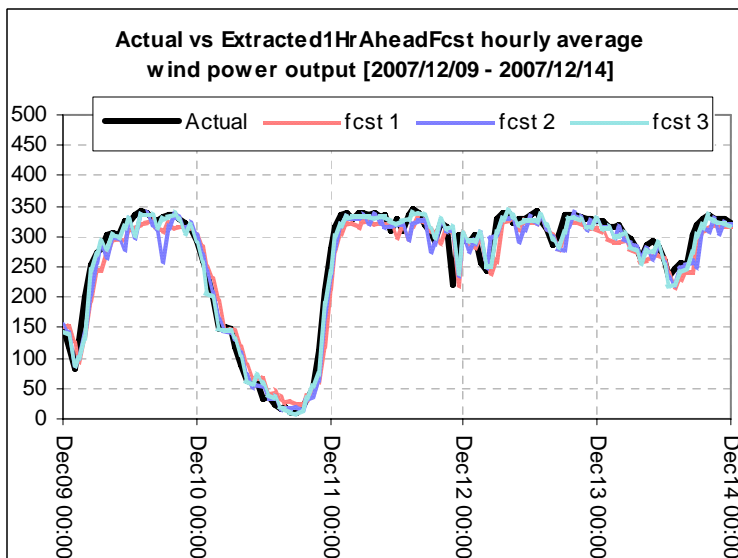
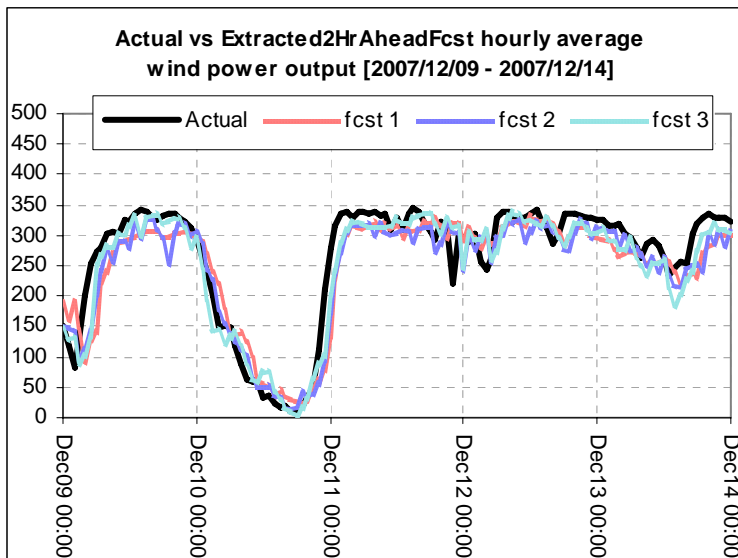
6.3 Event 3

The third event is not so much an event, but rather a different way to display the forecast information in a post analysis timeframe. The forecasts in the pilot project are provided to the AESO every hour. Each hourly forecast is for the next 48 hours. In the graphs below, we extract specific timeframes from the 48 hour forecasts. For example, if we extract the 48 hr ahead timeframe, at 0000 on Dec 11, we plot what the forecasters predicted for that hour at 0000 on Dec 9. At 0100 on Dec 11, we plot what the forecasters predicted for that hour at 0100 on Dec 9.

This approach illustrates how the forecast for an operating hour change, vary and improve as the forecasts approach the operating hour.







This past week was well predicted by the forecasters. In the figures of 6.3, the closer to the graphs get to real time, the more that persistence methods impact the forecasts. This means that the forecasts will correct or reset based on the current level of wind power.