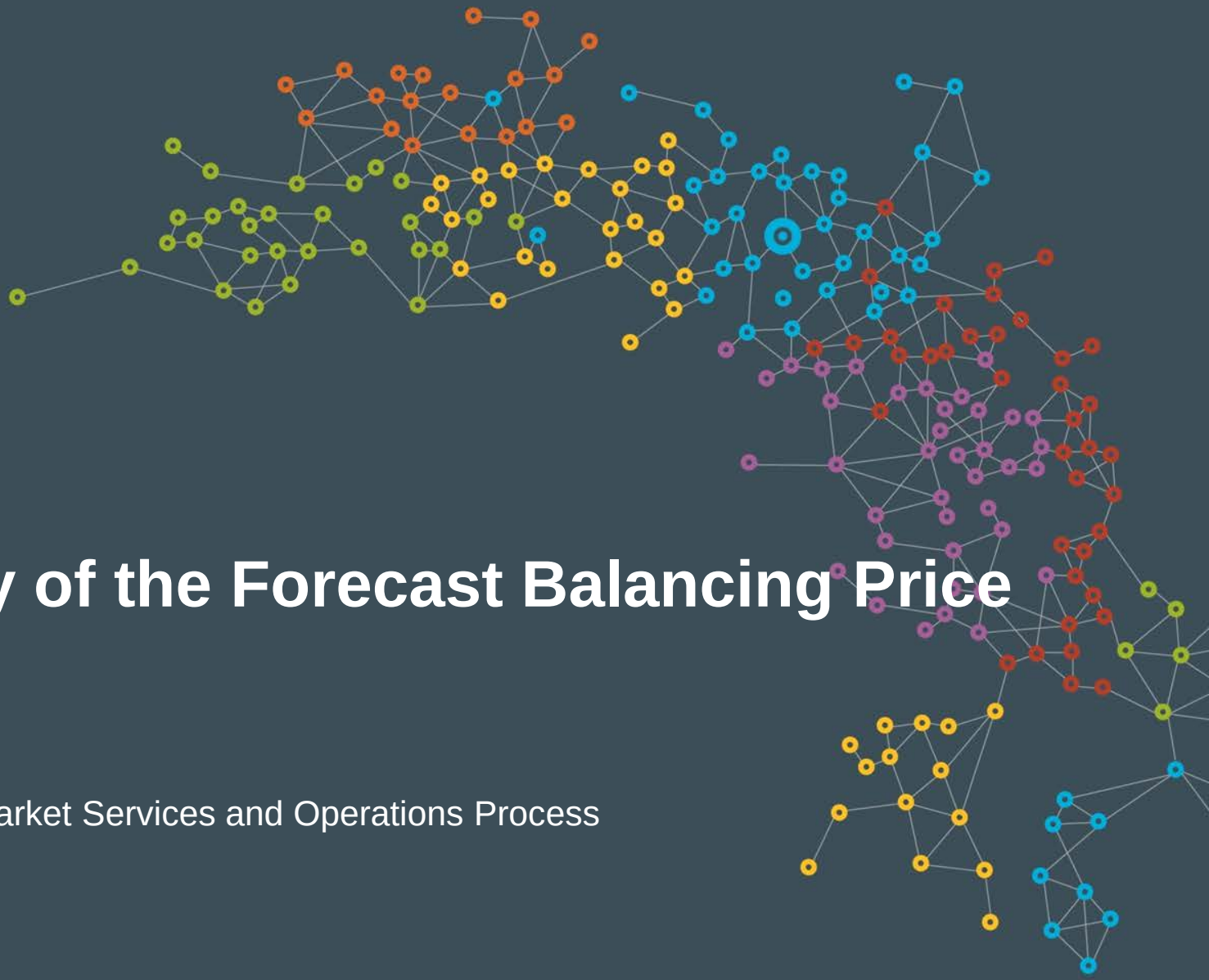
INDEPENDENT MARKET OPERATOR



Accuracy of the Forecast Balancing Price

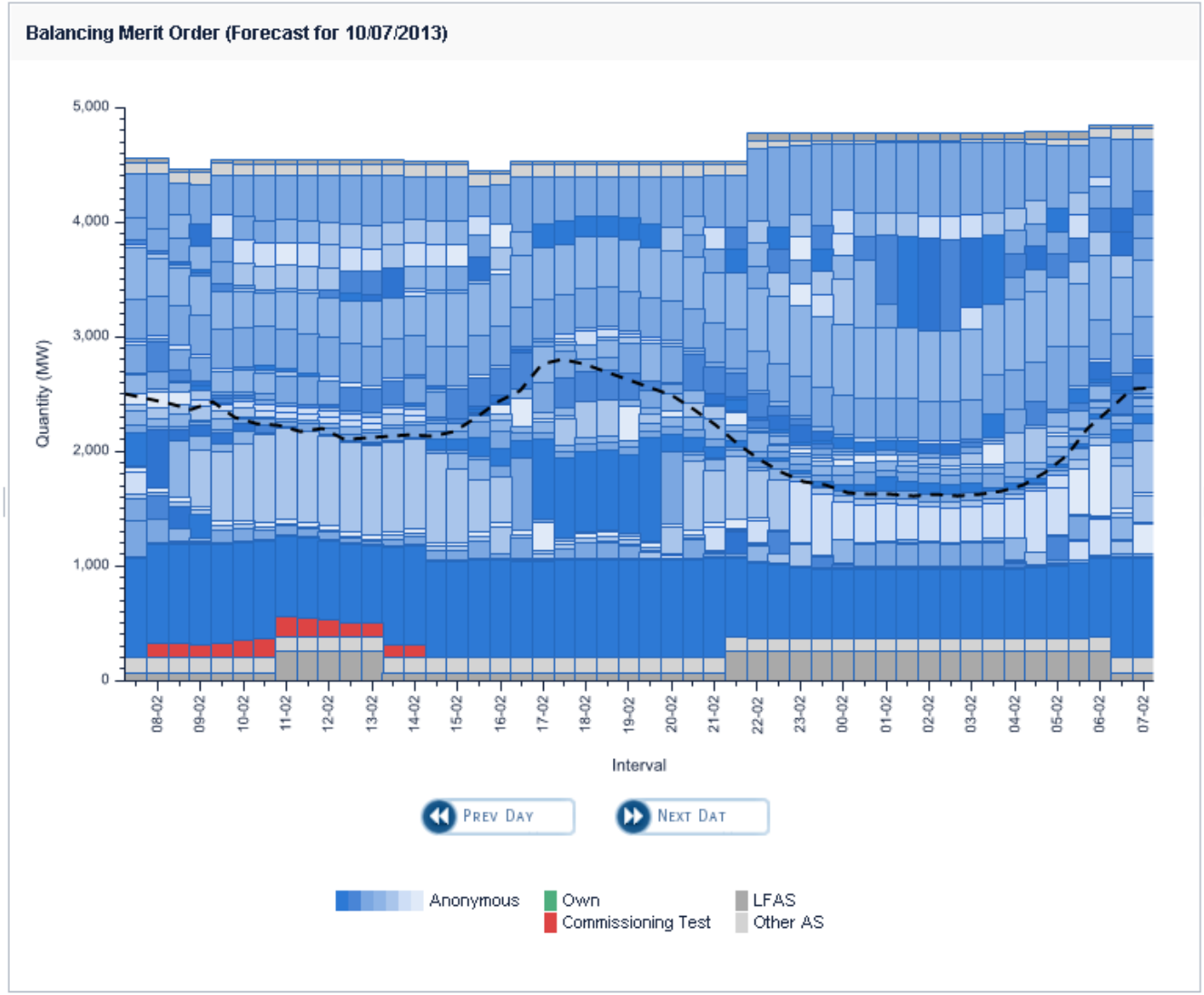
Paul Tetley
Team Leader – Market Services and Operations Process

March 2014

Balancing Price Forecast

- IMO aims to produce a forecast balancing price in which participants can have confidence
- Basis for commercial decisions by participants
- Last year we determined the forecast could be better

BMOs and load forecast for one trading day



Forecasts

- The forecast BMO for each trading interval undergoes up to 75 revisions before we send the final forecast to SM. The most important of these are:
  - Last pre-gate-closure forecast. This is the last forecast you can act upon.
  - Final Forecast. This is the one SM dispatches from.
- BMO forecasts in conjunction with SM's load forecasts give a forecast balancing price
- Final balancing price calculated 3 business days after the Trading Day of the interval. Ramp-rate constrained.

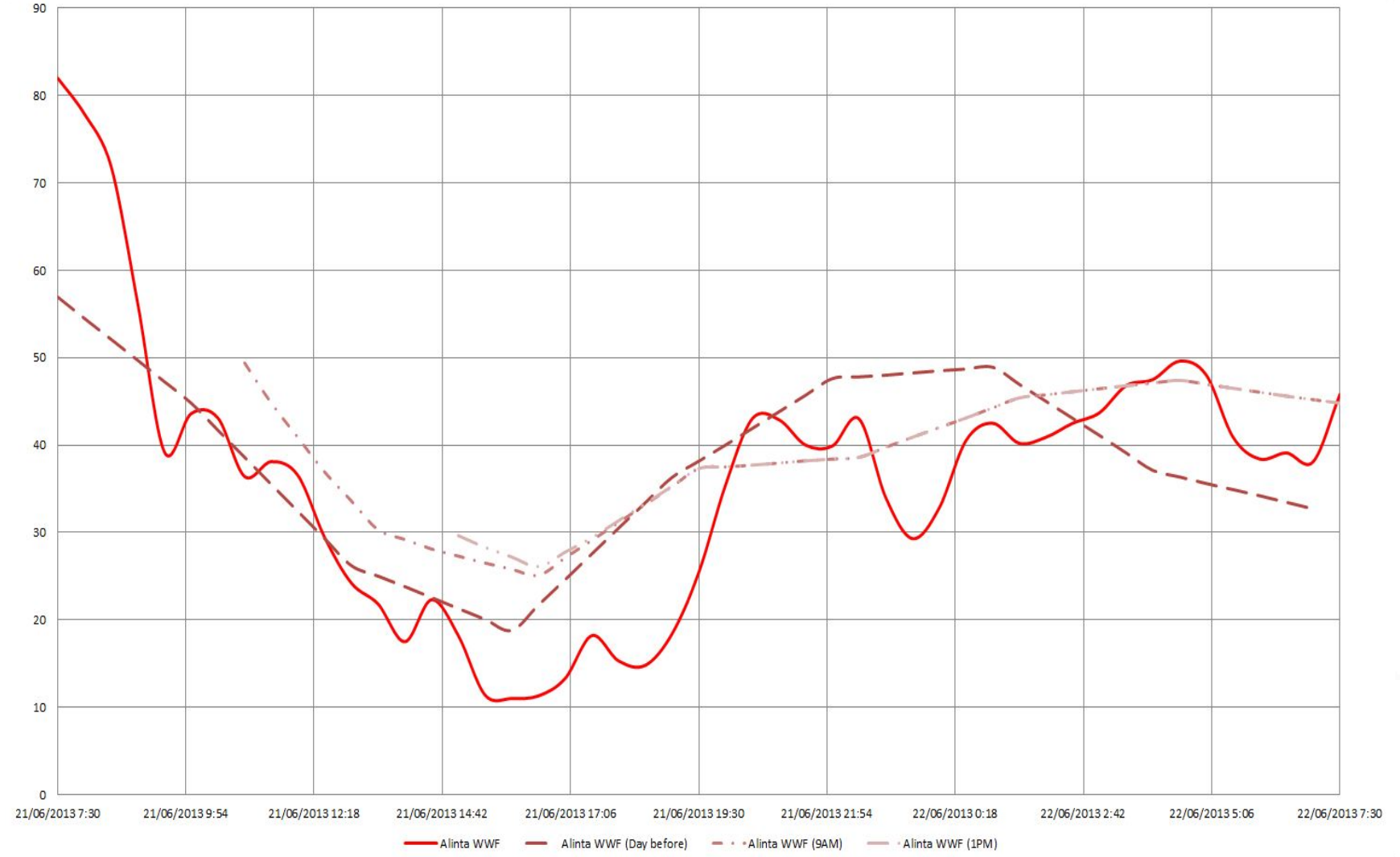
What can go wrong?

- BMO stack subject to NSG error
  - Generating more or less than was offered in Balancing Submissions
- Load is higher or lower than forecast
- Either way, the LF intersects a different tranche and the BP changes

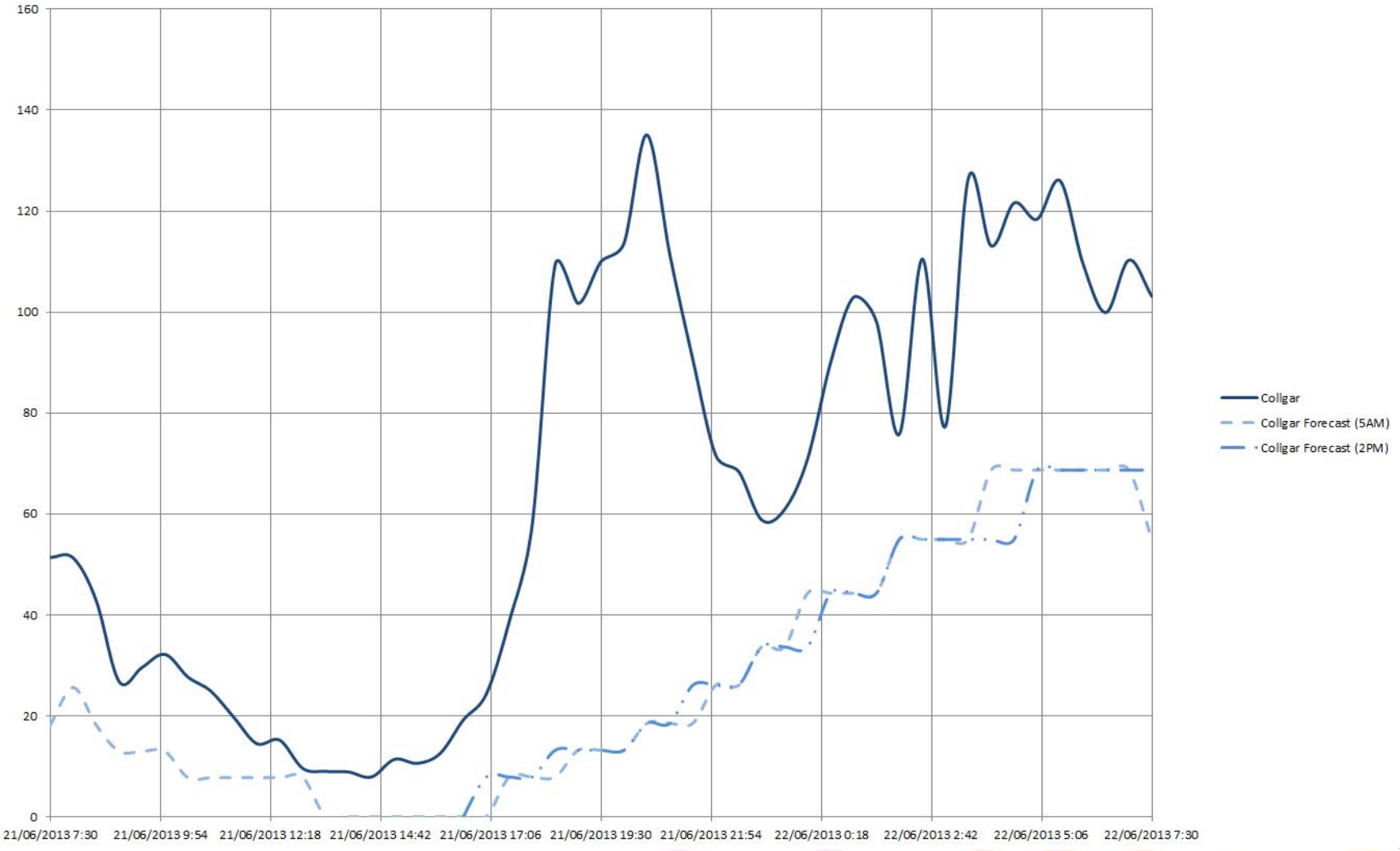
Non Scheduled Generators

- It was observed in June 2013 that some large NSG's Balancing submissions were significantly different from their generation
- Errors of between 50 and 100MW per interval were common

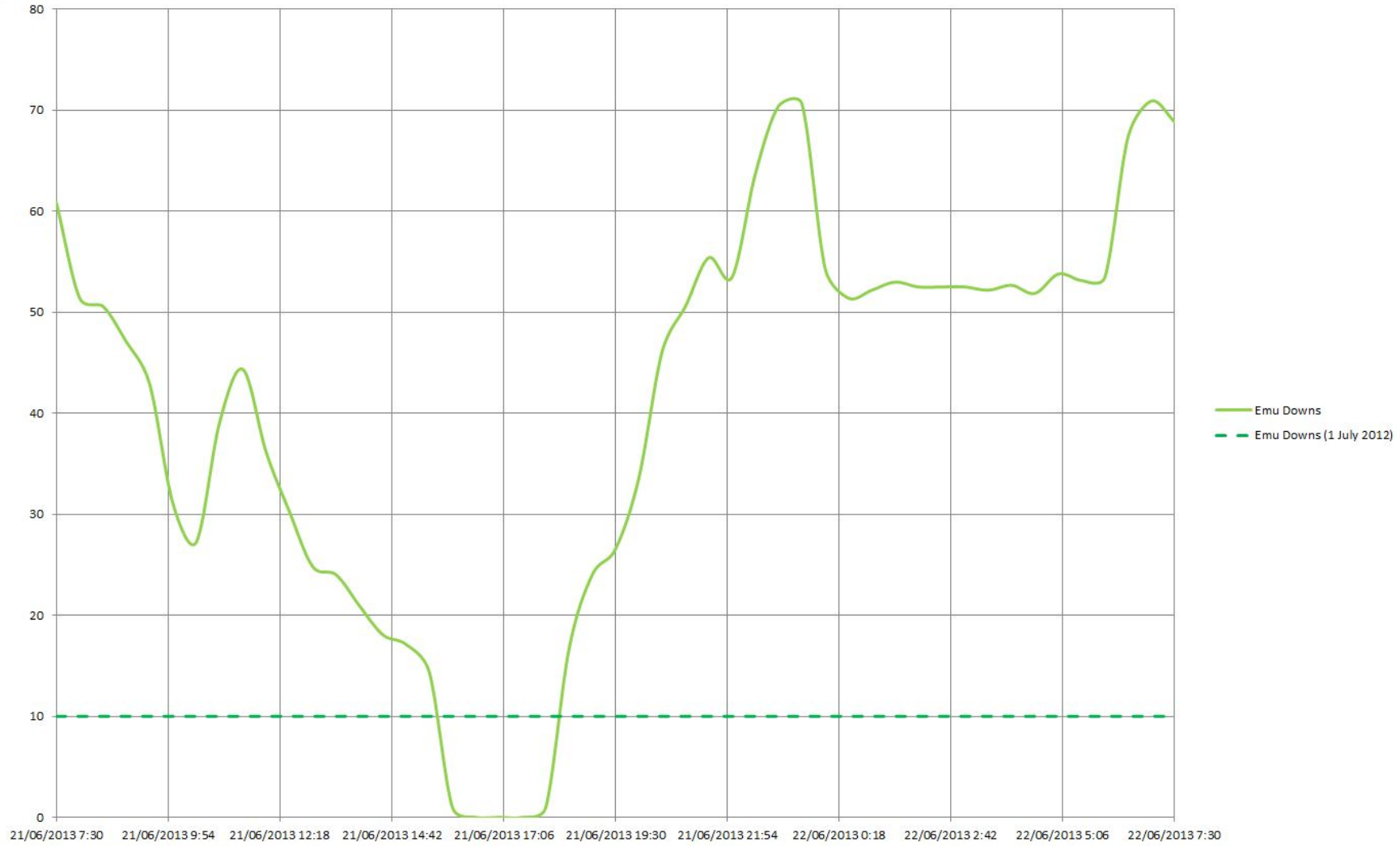
WWF


90
80
70
60
50
40
30
20
10
0
21/06/2013 7:30
21/06/2013 9:54
21/06/2013 12:18
21/06/2013 14:42
21/06/2013 17:06
21/06/2013 19:30
21/06/2013 21:54
22/06/2013 0:18
22/06/2013 2:42
22/06/2013 5:06
22/06/2013 7:30
Alinta WWF
Alinta WWF (Day before)
Alinta WWF (9AM)
Alinta WWF (1PM)

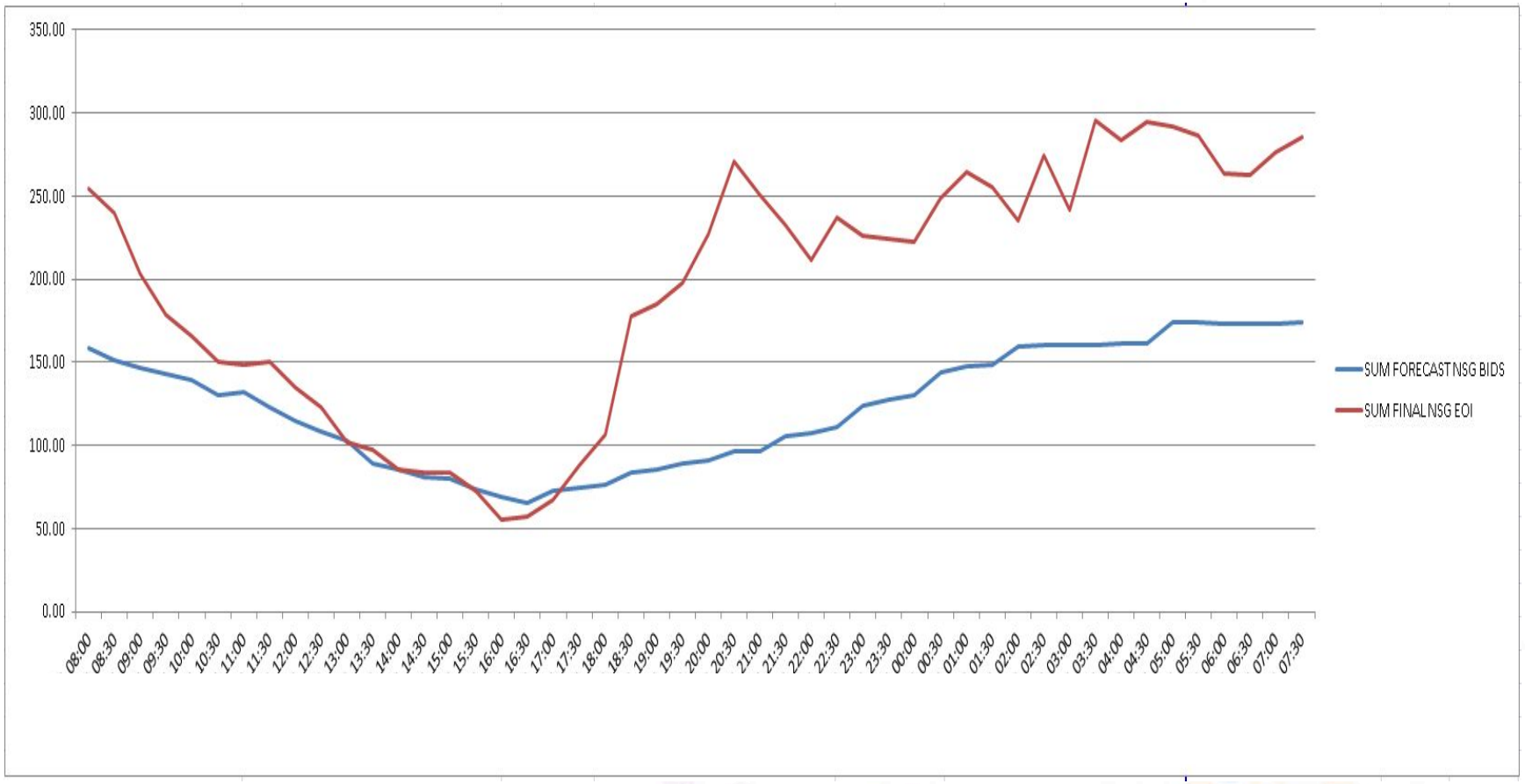
Collgar


160
140
120
100
80
60
40
20
0
21/06/2013 7:30
21/06/2013 9:54
21/06/2013 12:18
21/06/2013 14:42
21/06/2013 17:06
21/06/2013 19:30
21/06/2013 21:54
22/06/2013 0:18
22/06/2013 2:42
22/06/2013 5:06
22/06/2013 7:30
Collgar
Collgar Forecast (5AM)
Collgar Forecast (2PM)

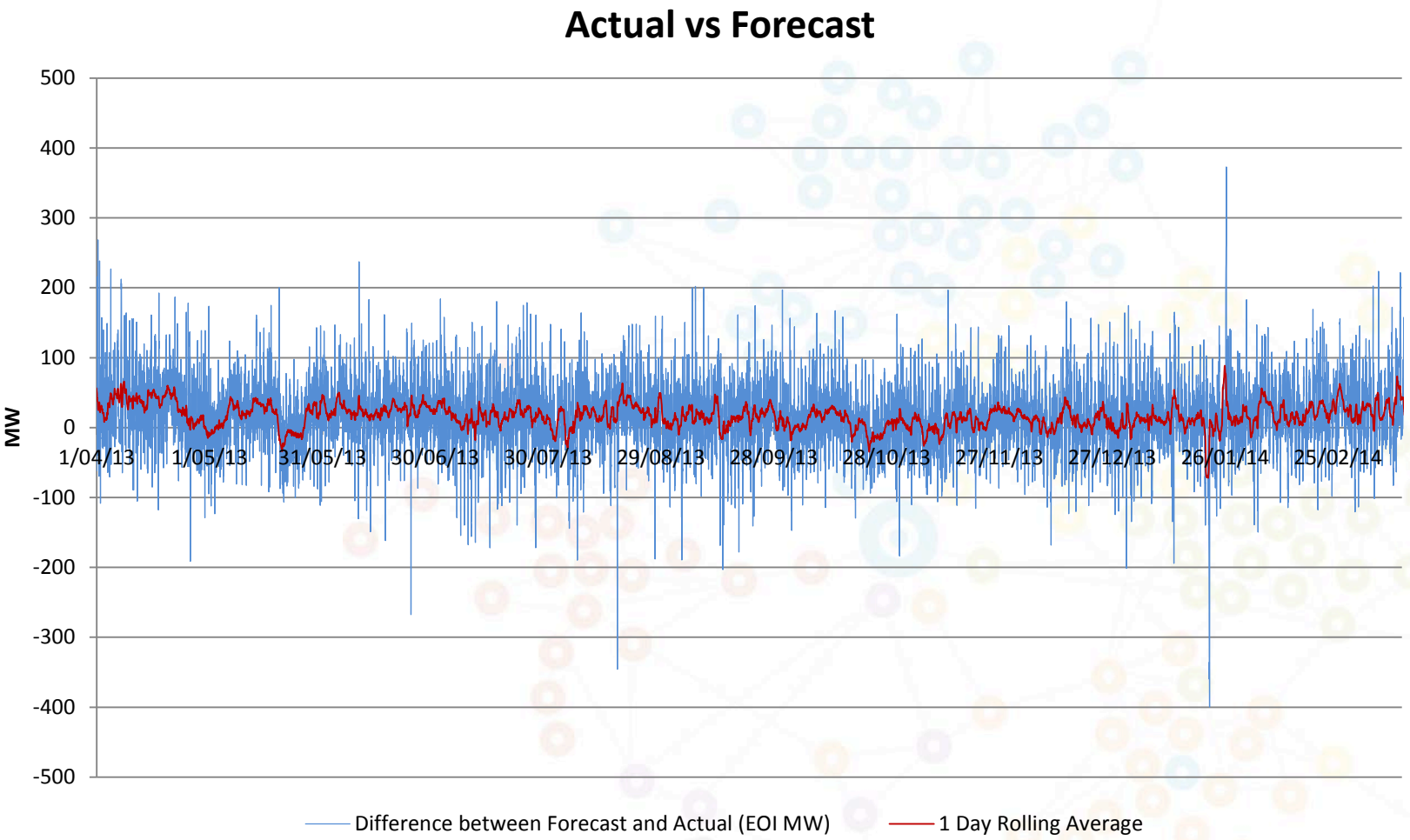
EDWF


80
70
60
50
40
30
20
10
0
21/06/2013 7:30
21/06/2013 9:54
21/06/2013 12:18
21/06/2013 14:42
21/06/2013 17:06
21/06/2013 19:30
21/06/2013 21:54
22/06/2013 0:18
22/06/2013 2:42
22/06/2013 5:06
22/06/2013 7:30
Emu Downs
Emu Downs (1 July 2012)

Non Scheduled Generators – 21 June 2013

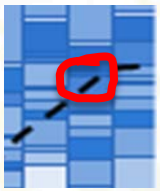


Load forecast error



Price Sensitivity

- Input forecasts all result in MW errors (tranche quantity or load forecast)
- But price impact depends upon makeup of BMO.
  - High Sensitivity - $70 to $120 step:

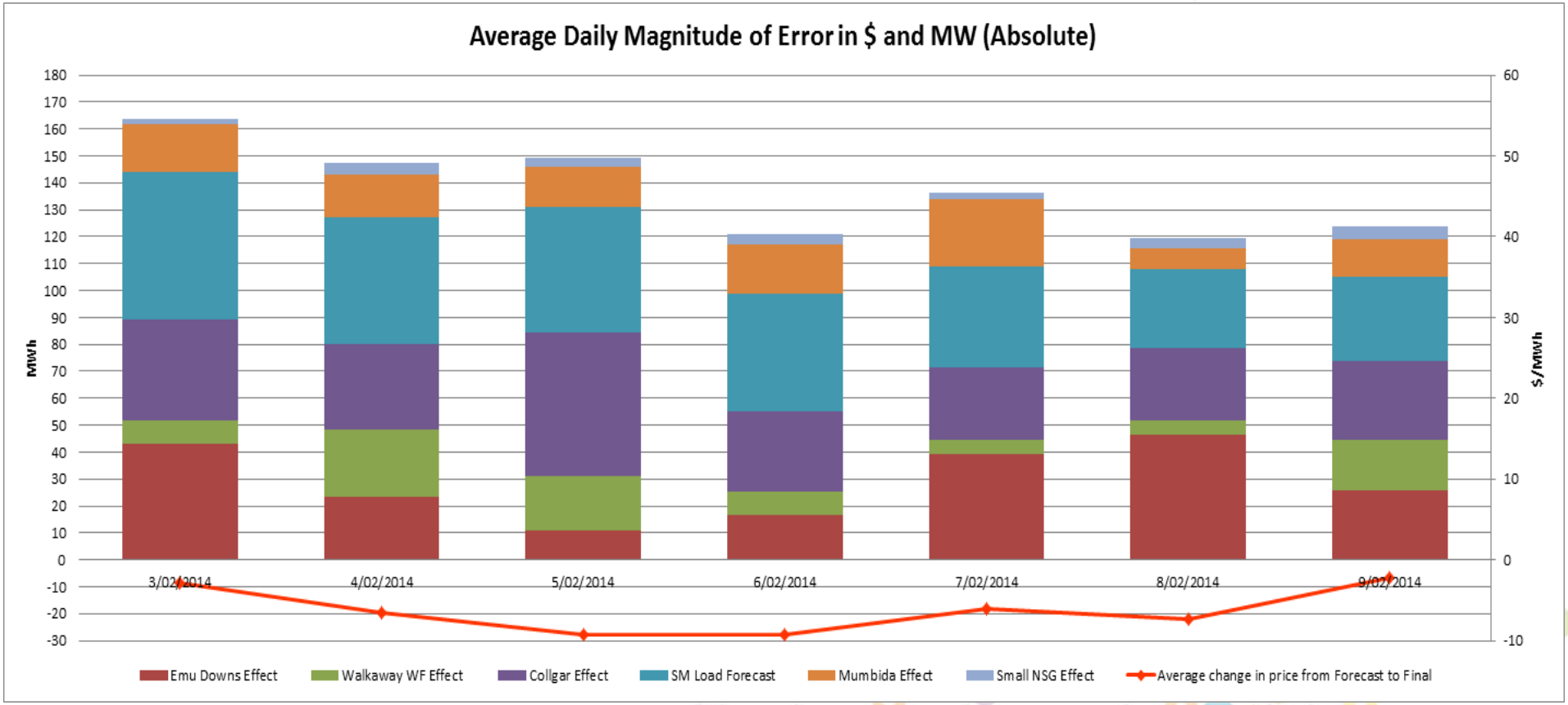


  - Low Sensitivity – 200MW Tranche:

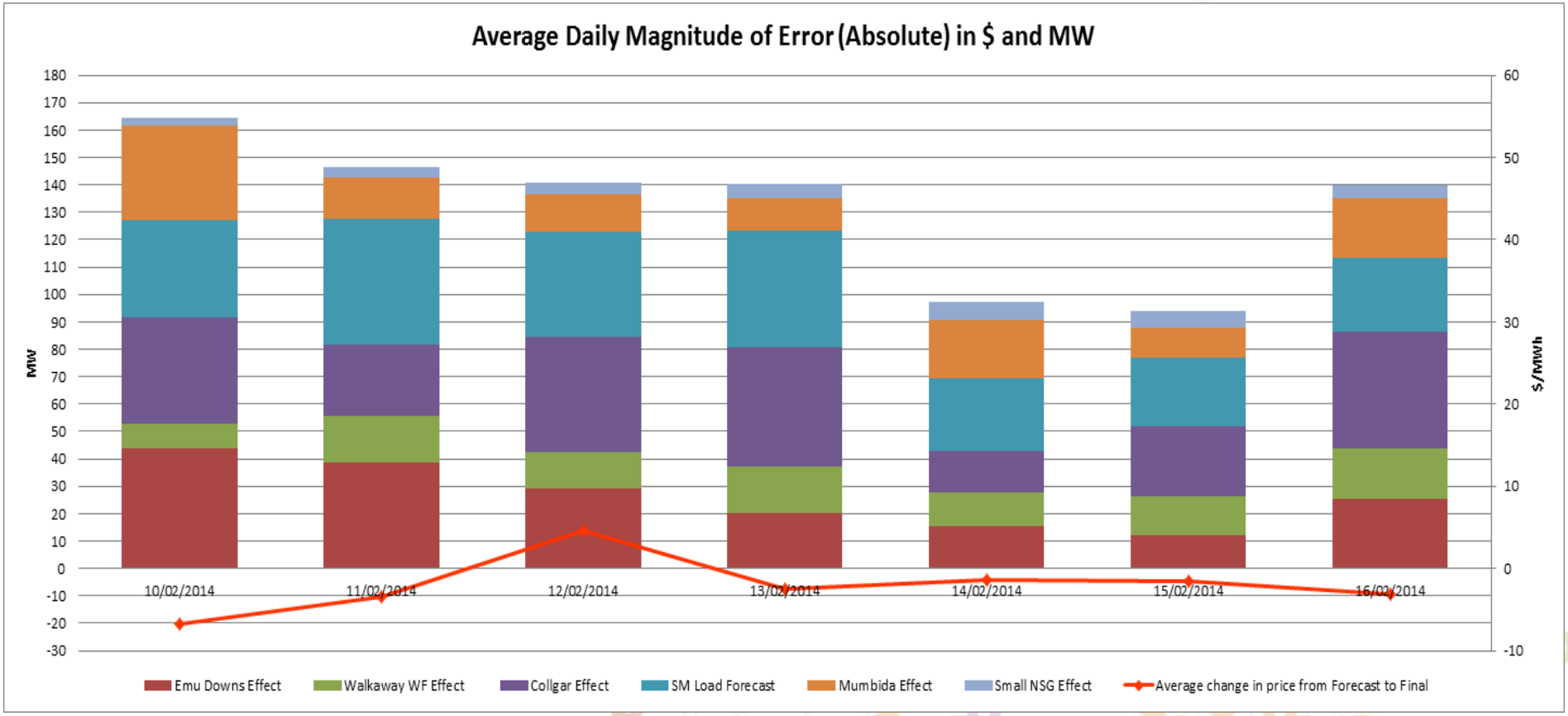
Progress to Dec 2013

- Met with SM Forecasting team
  - Discussed systems/models/issues
  - Discussed future improvements
- Met with four largest wind farms in the SWIS:
  - Collgar, Walkaway, Emu Downs and Mumbida
- Collected various internal metrics which were interesting, but nothing was changing…

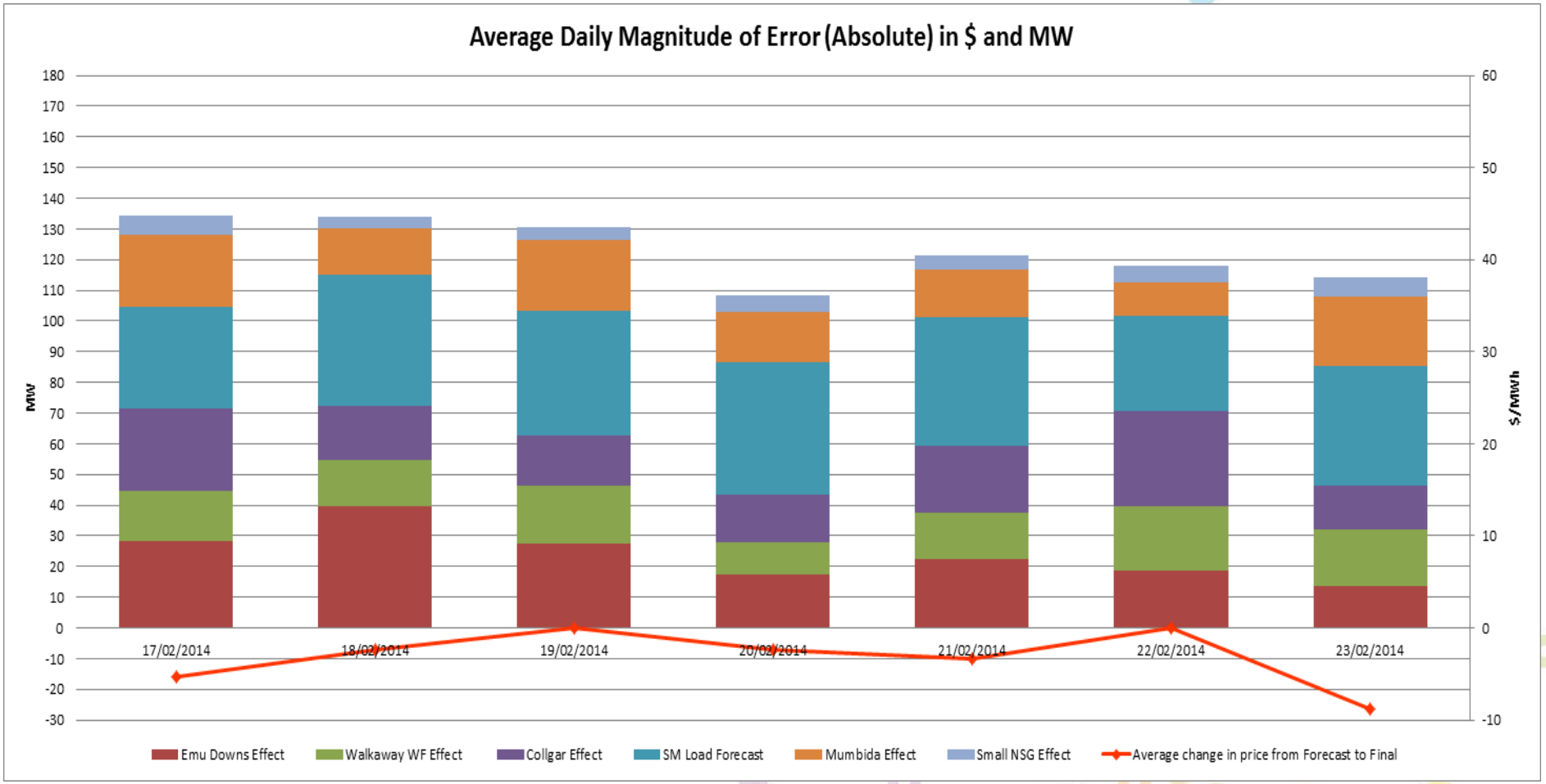
12 Feb 2014 First Mail-out



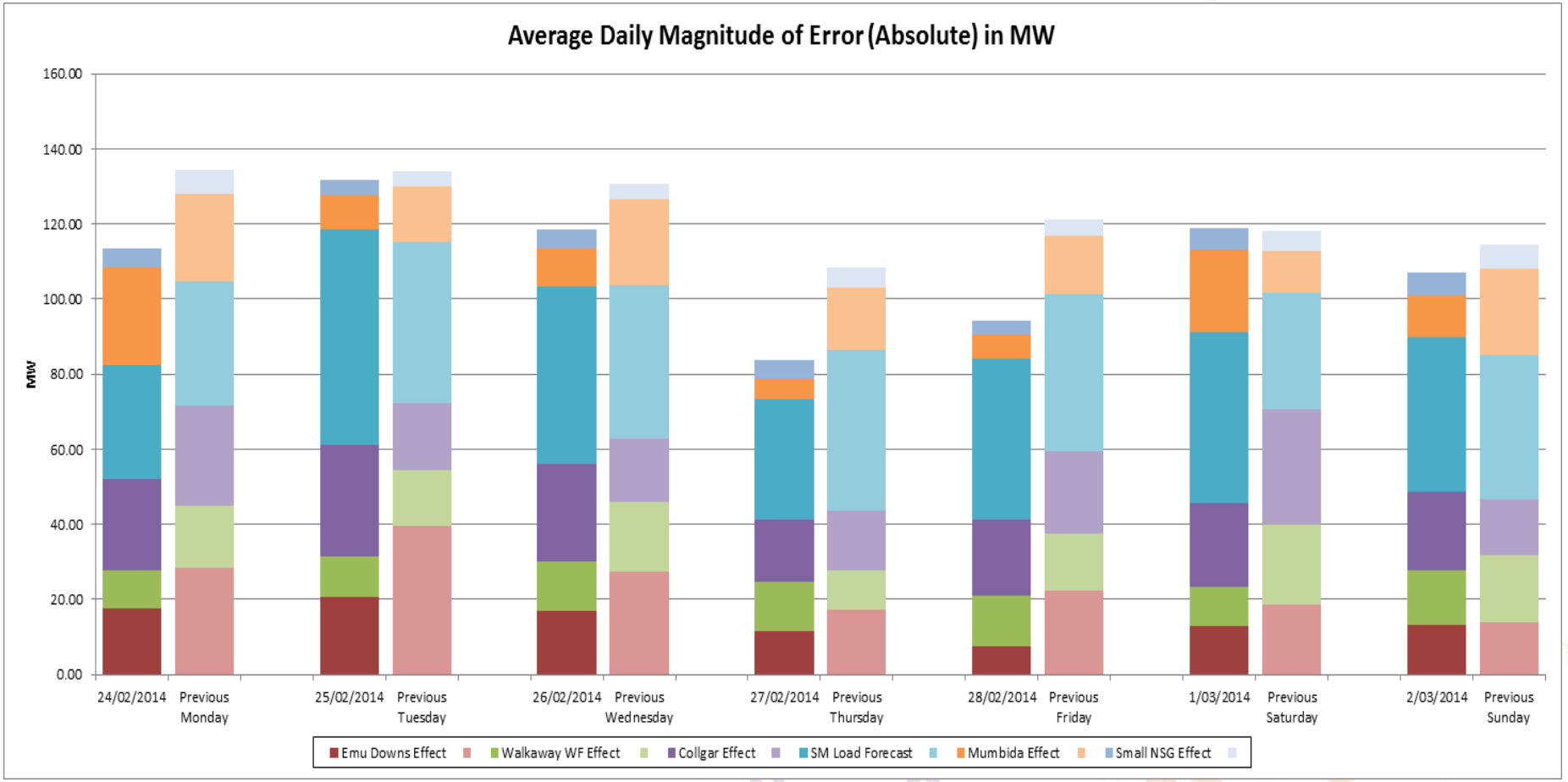
19 Feb 2014


Average Daily Magnitude of Error (Absolute) in $ and MW
MW
$/MWh
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
60
50
40
30
20
10
0
-10
10/02/2014
11/02/2014
12/02/2014
13/02/2014
14/02/2014
15/02/2014
16/02/2014
Emu Downs Effect
Walkaway WF Effect
Collgar Effect
SM Load Forecast
Mumbida Effect
Small NSG Effect
Average change in price from Forecast to Final

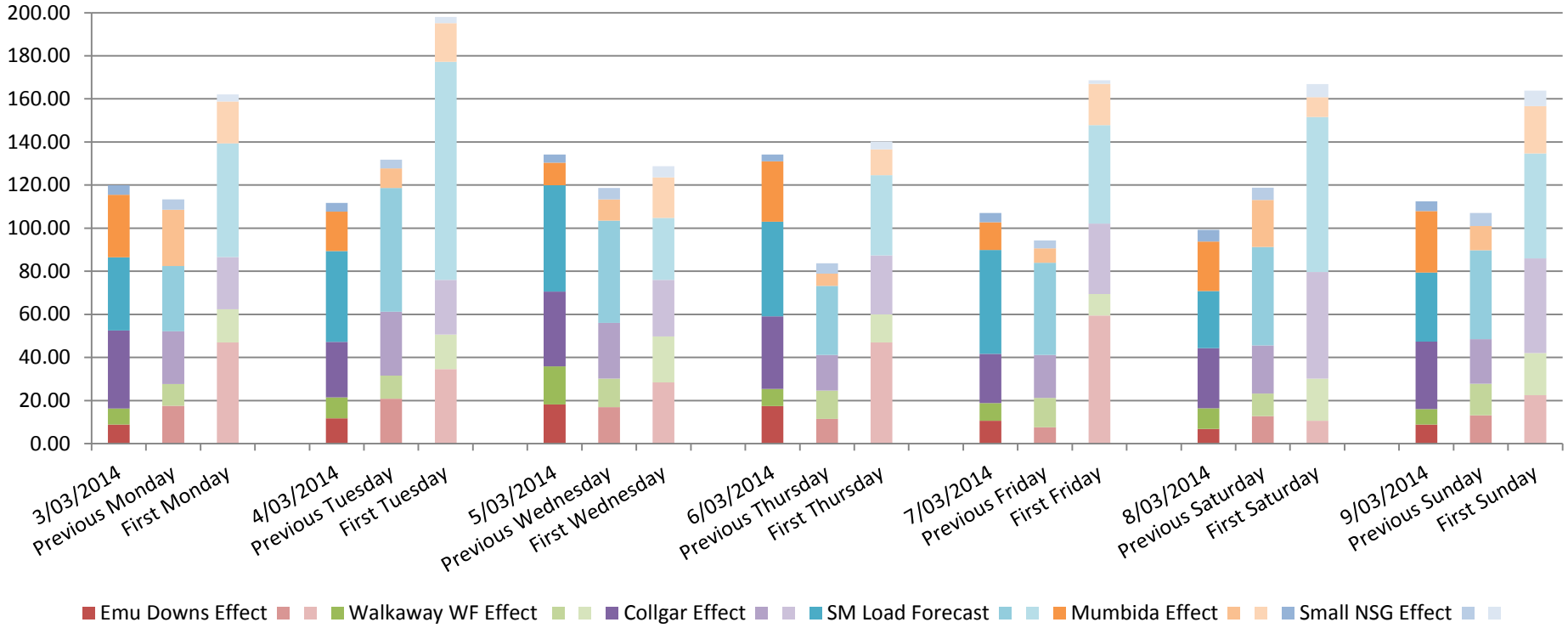
26 Feb 2014


Average Daily Magnitude of Error (Absolute) in $ and MW
MW
$/MWh
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
60
50
40
30
20
10
0
-10
17/02/2014
18/02/2014
19/02/2014
20/02/2014
21/02/2014
22/02/2014
23/02/2014
Emu Downs Effect
Walkaway WF Effect
Collgar Effect
SM Load Forecast
Mumbida Effect
Small NSG Effect
Average change in price from Forecast to Final

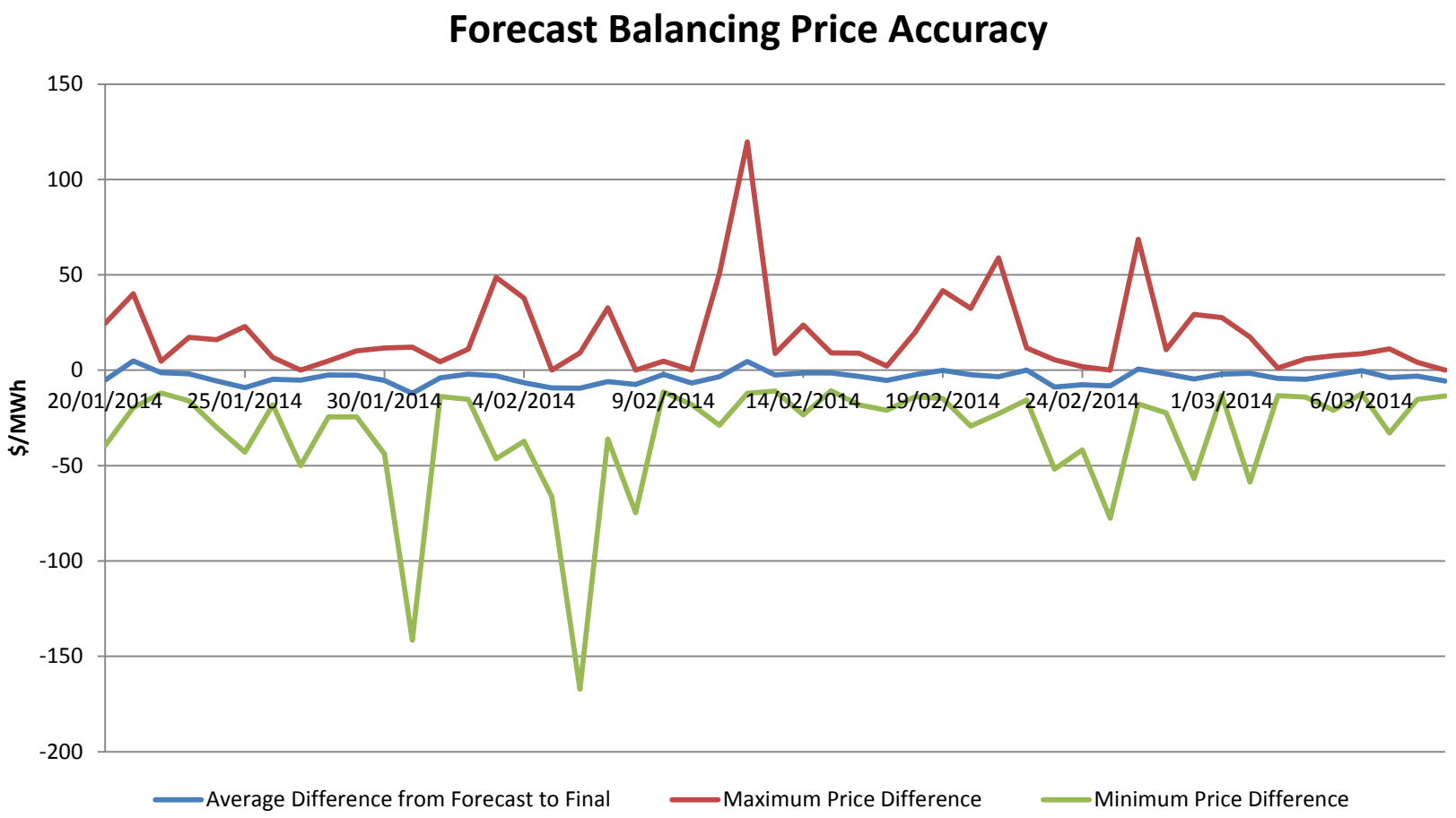
5 March 2014


Average Daily Magnitude of Error (Absolute) in MW
MW
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
24/02/2014
Previous Monday
25/02/2014
Previous Tuesday
26/02/2014
Previous Wednesday
27/02/2014
Previous Thursday
28/02/2014
Previous Friday
1/03/2014
Previous Saturday
2/03/2014
Previous Sunday
Emu Downs Effect
Walkaway WF Effect
Collgar Effect
SM Load Forecast
Mumbida Effect
Small NSG Effect

12 March 2014



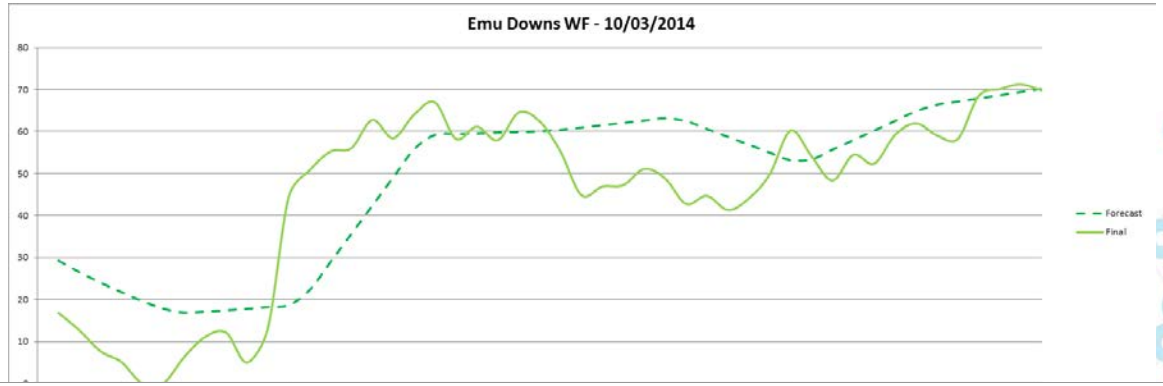
Improvement in Max/Min error

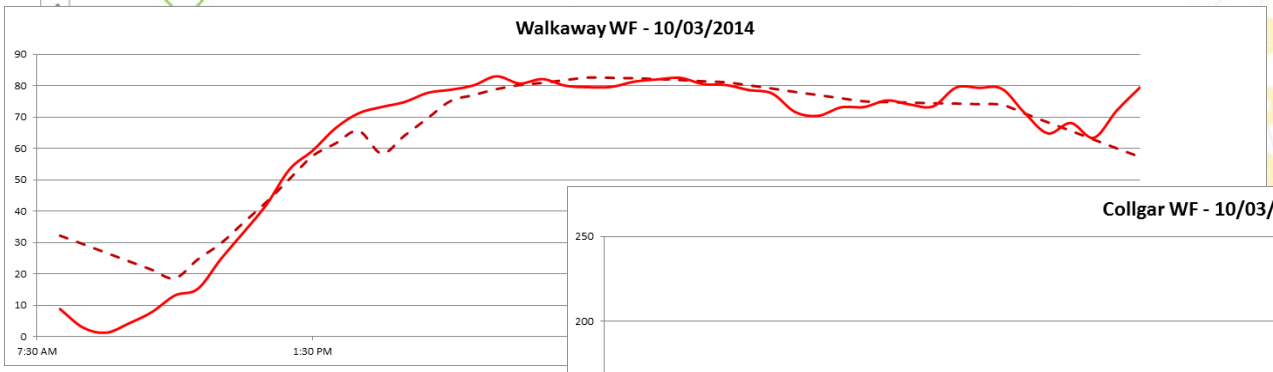


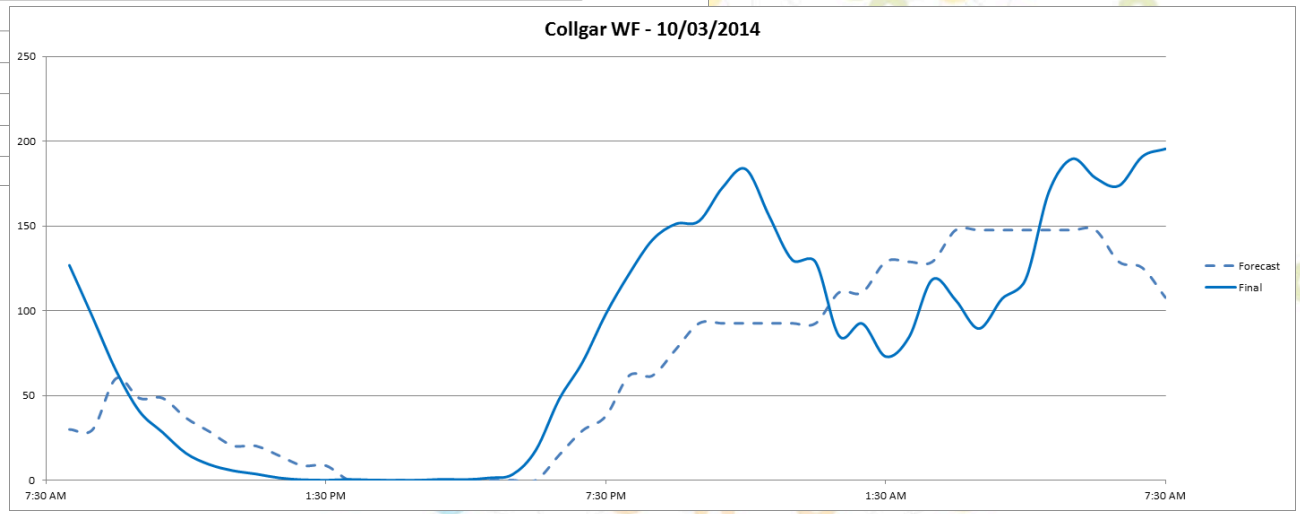
Timeline

- June 2013 – IMO discussed internally the impact of NSG forecasts (BMO submissions)
- August 2013 – Commenced investigation and meetings with wind farms. Metrics capture. Improvement work commences.
- Feb 2014 Internal metrics shared; EDWF system upgrade
- Mar 2014 Clear improvements observed

The present day…







Thanks

- The IMO can't directly improve this forecast.
- Thanks to Shane and EDWF for being the first mover. Your work has had a material impact.
- Thanks to System Management for coming along today to share your load forecasting issues.
- Thanks to other NSGs who are now undertaking upgrades – we look forward to seeing the benefits this will have for the WEM.

Where to next?

- Continue mail-outs. Encourage participants to improve.
- Further NSG improvements expected in the next few months.
- More analysis:
  - Quality of earlier forecasts not yet thoroughly examined
  - Examine price gradient around the forecast load level. Are bidders moving in?
  - Long term expectations – when are we ‘done’?