Wind Forecast Monitoring Report

June 2010 quarter

Contents

1. Introduction

The purpose of this quarterly report is to present information about the quality of wind generation forecasts, provided by each wind farm, that are used to produce pre-dispatch schedules.

The charts in this quarterly report relate to generation from offered wind farms during the June 2010 quarter. The offered wind farms are shown in Figure 1.

Figure 1: Offered wind farms

Wind farm	Injection node	Nominal capacity (MW)
Tararua wind farm (BPE0331)	BPE0331	37
Tararua wind farm (LTN0331)	LTN0331	36
Tararua wind farm (TWC2201)	TWC2201	93
Te Apiti	WDV1101	91
Te Rere Hau	TWC2201	31[1]
West Wind	WWD1102 and WWD1103	143
White Hill	NMA0331	58

The report compares actual generation with the forecast of generation contained in offers submitted by those wind farms and used in pre-dispatch schedules.

Five kinds of charts are contained in this report:

- **Bias in forecasts:** This chart compares mean half hour generation (in average MW) with the mean six hour ahead forecast (in average MW). The chart shows this comparison separately for each offered wind farm.

- **Half hour energy (six hours ahead):** There is a separate chart for each offered wind farm. The chart is a scatter plot of the forecast half hour generation against actual half hour generation (in average MW). Each trading period in the quarter is represented by a point on the chart. The forecast used is the latest forecast that is available six hours prior to the beginning of the trading period. The chart also shows a line of best fit through the scatter plot (the solid red line), and a 45° reference line (the dotted blue line).

  Note: Some wind farms exhibit a tendency to offer at particular quantity points (e.g. they tend to offer exactly 20MW or exactly 24MW but not values in-between). This makes it difficult to visualise in a scatter plot the number of points in a particular area of the chart since the observations

[1] For Te Rere Hau the "nominal capacity" figure is the maximum observed output during the quarter.

often appear on top of one another. In order to make the scatter plots more informative a small amount of random "noise" has been added to the half hour forecast figures for the Tararua wind farms (injecting at BPE0331, LTN0331 and TWC2201) for the purpose of the half hour energy charts. This helps to visualise the "dark areas" of those charts where there are a lot of observations.

- **Eight hour energy (three hours ahead):** There is a separate chart for each offered wind farm. The chart is a scatter plot of the forecast generation over a rolling eight hour period against actual generation over the same eight hour period. The forecast used is the latest forecast available three hours prior to the beginning of the eight hour period. The chart also shows a line of best fit through the scatter plot (the solid red line), and a 45° reference line (the dotted blue line).

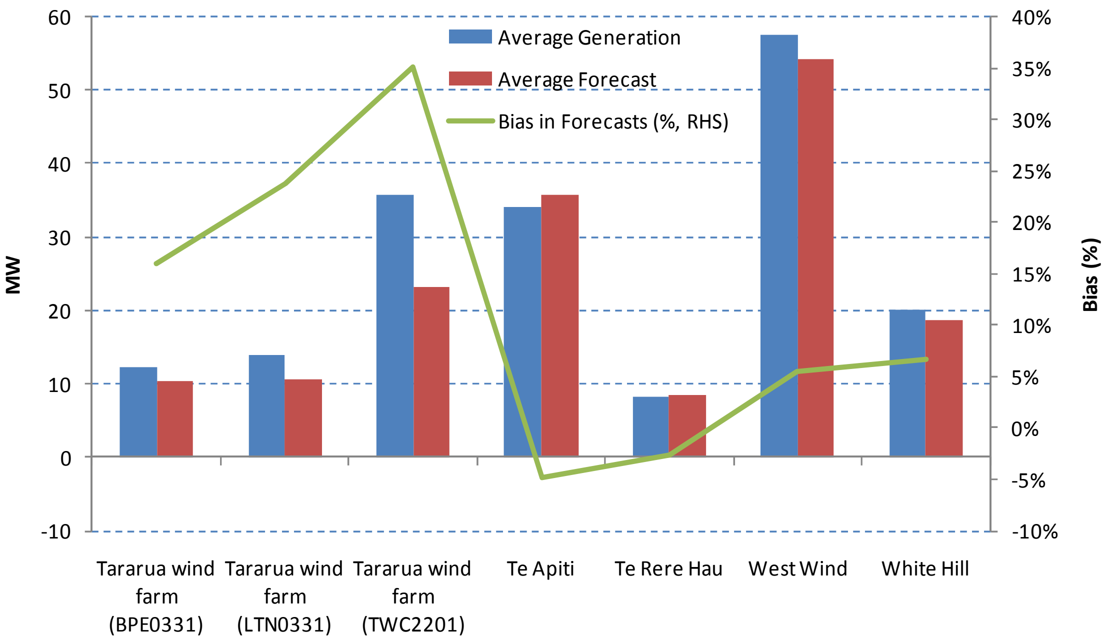
- **Half hour best fit comparisons:** This chart takes the line of best fit for each offered wind farm from the half hour energy charts. It compares them in a single chart, scaling each by the wind farm's nominal capacity.

- **Eight hour best fit comparisons:** This chart takes the line of best fit for each offered wind farm from the eight hour energy charts. It compares them in a single chart, scaling each by the wind farm's nominal capacity.

Further information on data sources and methodology is included in a technical appendix.

2. Average generation and average forecast

Figure 2: Average generation and average forecast



3. Half hour and eight hour energy charts by wind farm

This section contains the following charts:

Figure 3 - Tararua wind farm (BPE0331) half hour energy

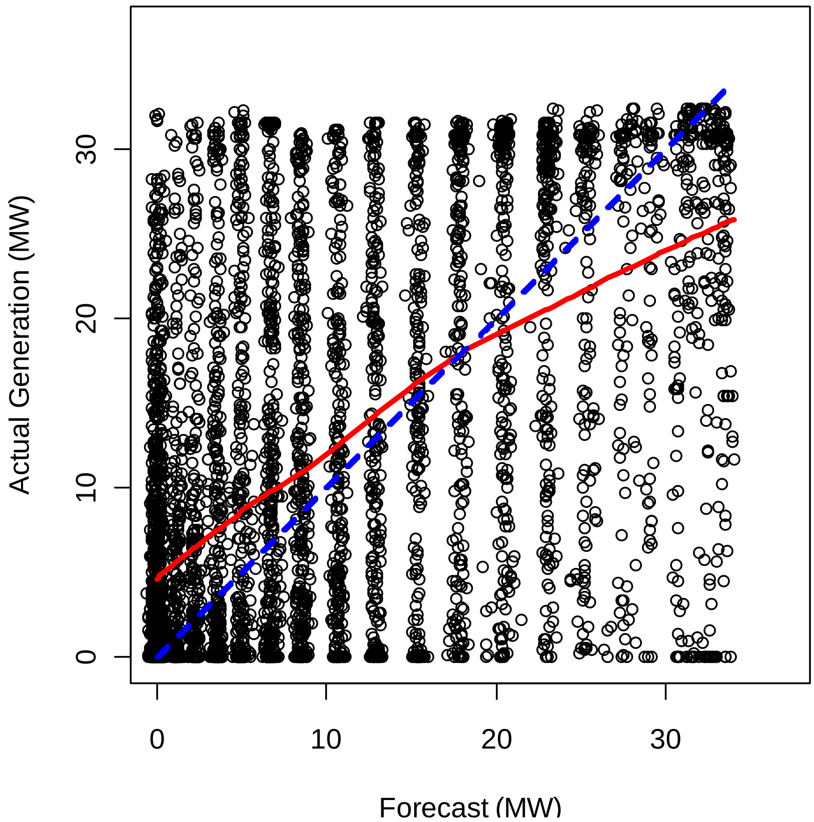


Figure 4 – Tararua wind farm (BPE0331) eight hour energy

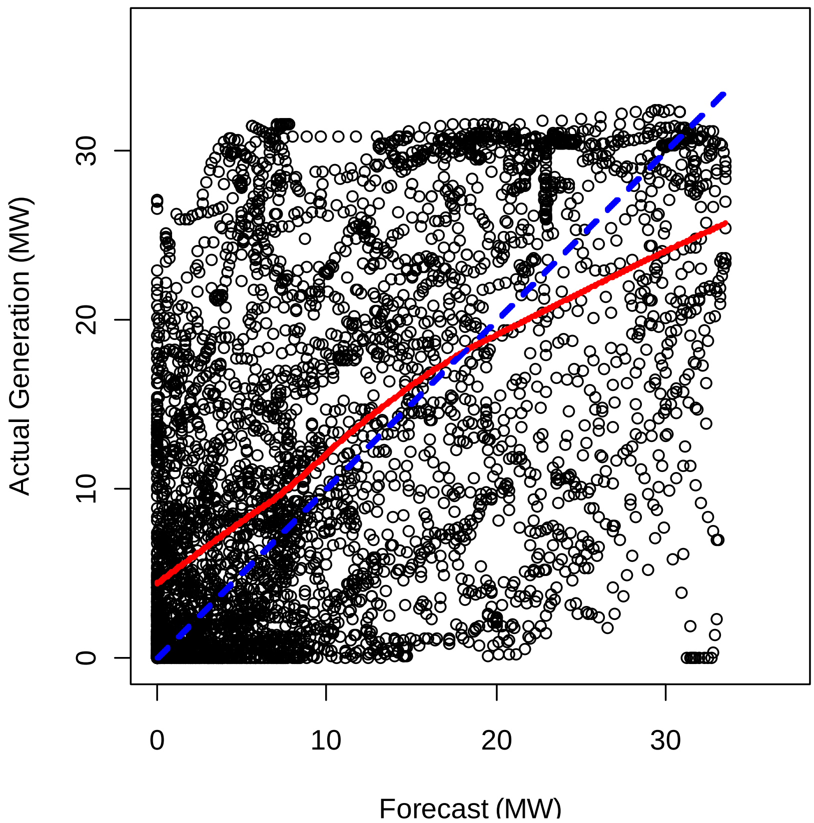


Figure 5 – Tararua wind farm (LTN0331) half hour energy

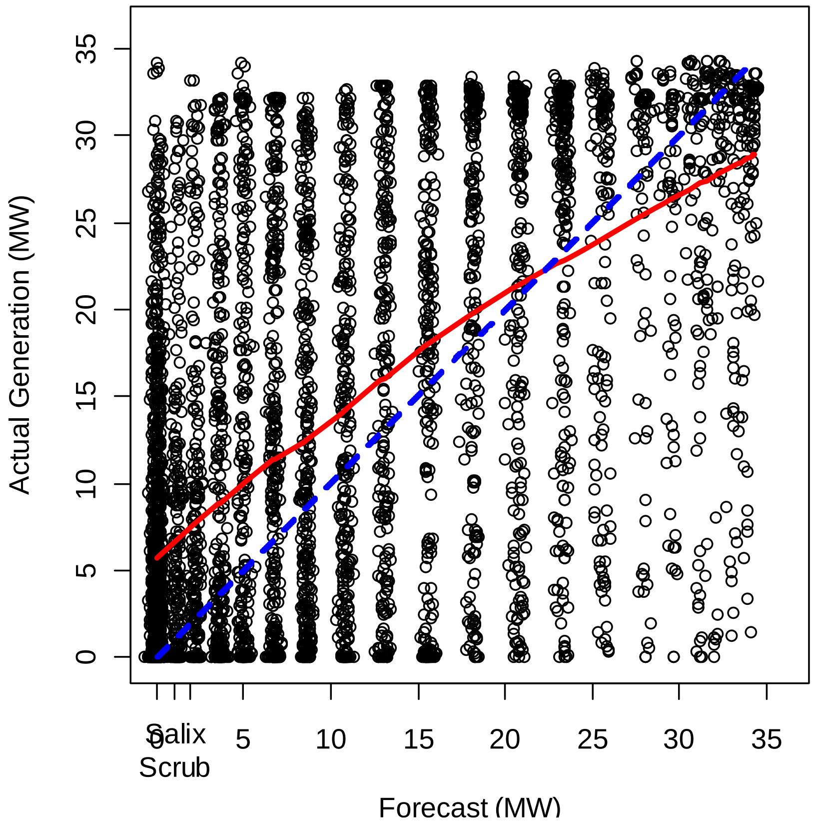


Figure 6 – Tararua wind farm (LTN0331) eight hour energy

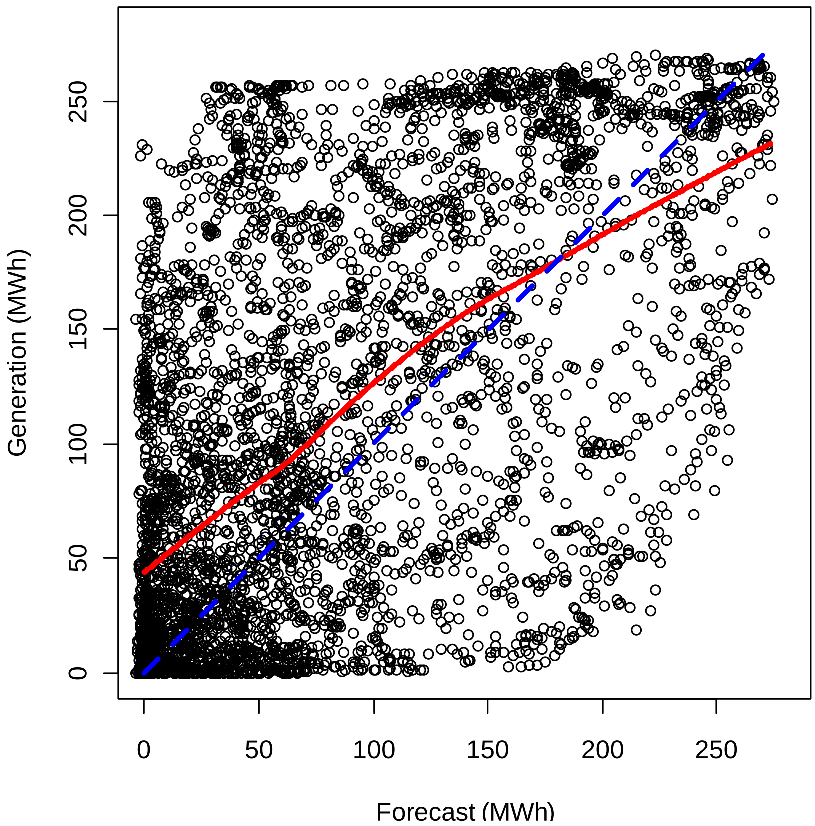


Figure 7 - Tararua wind farm (TWC2201) half hour energy

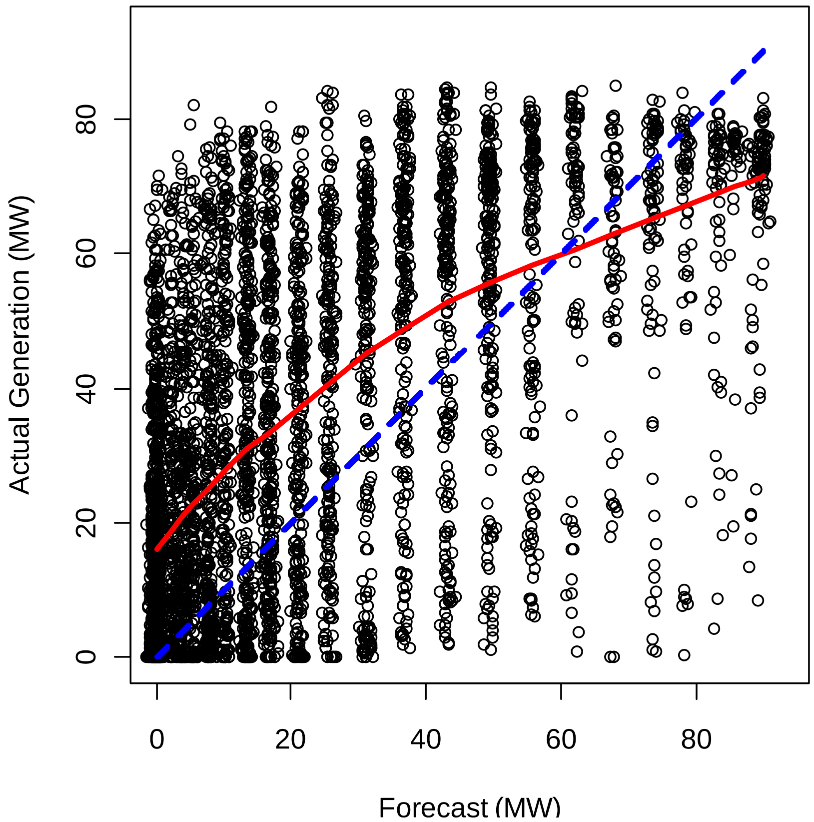


Figure 8 – Tararua wind farm (TWC2201) eight hour energy

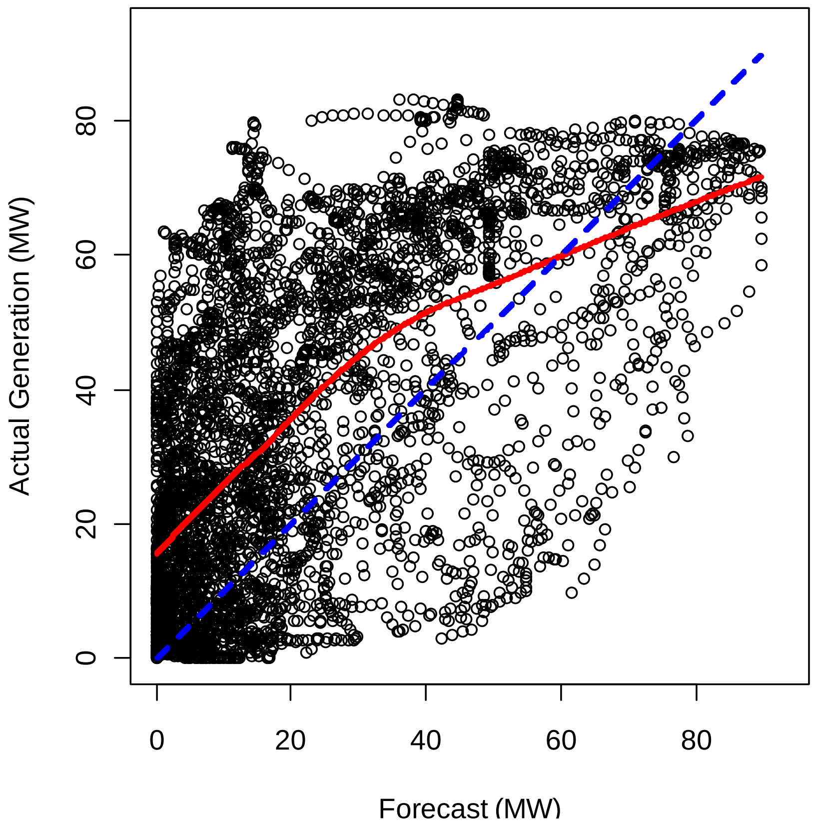


Figure 9 - West Wind half hour energy

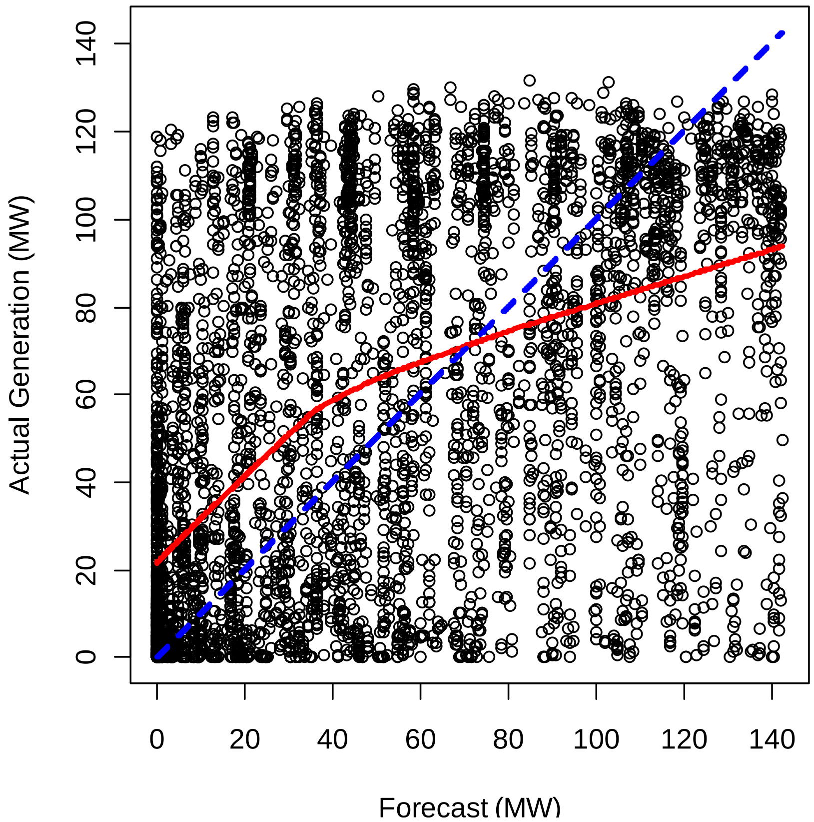


Figure 10 - West Wind eight hour energy

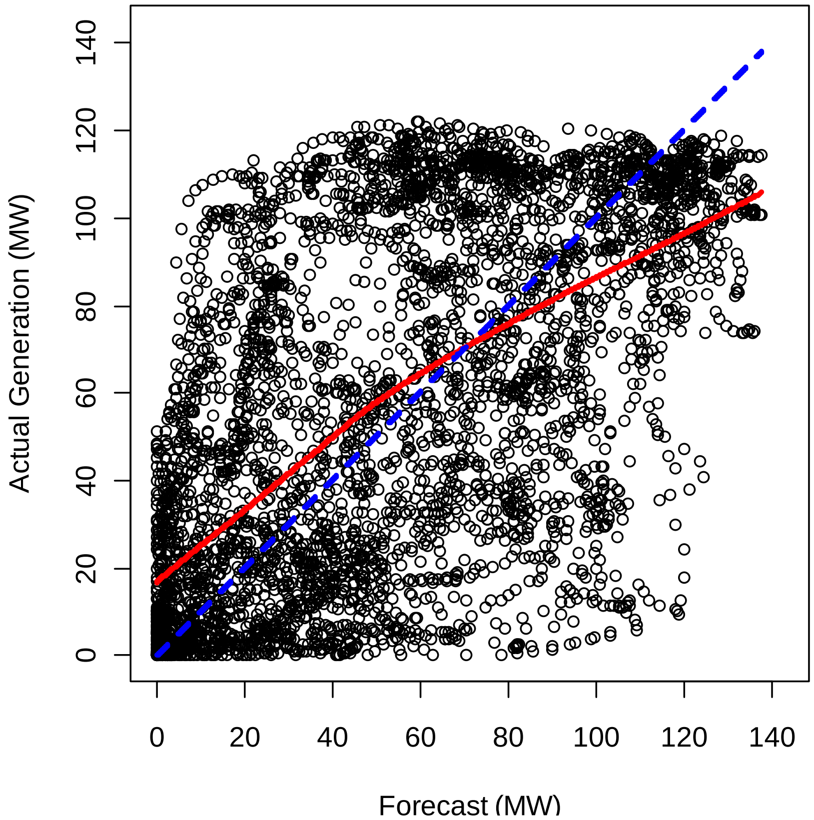


Figure 11 - Te Apiti half hour energy

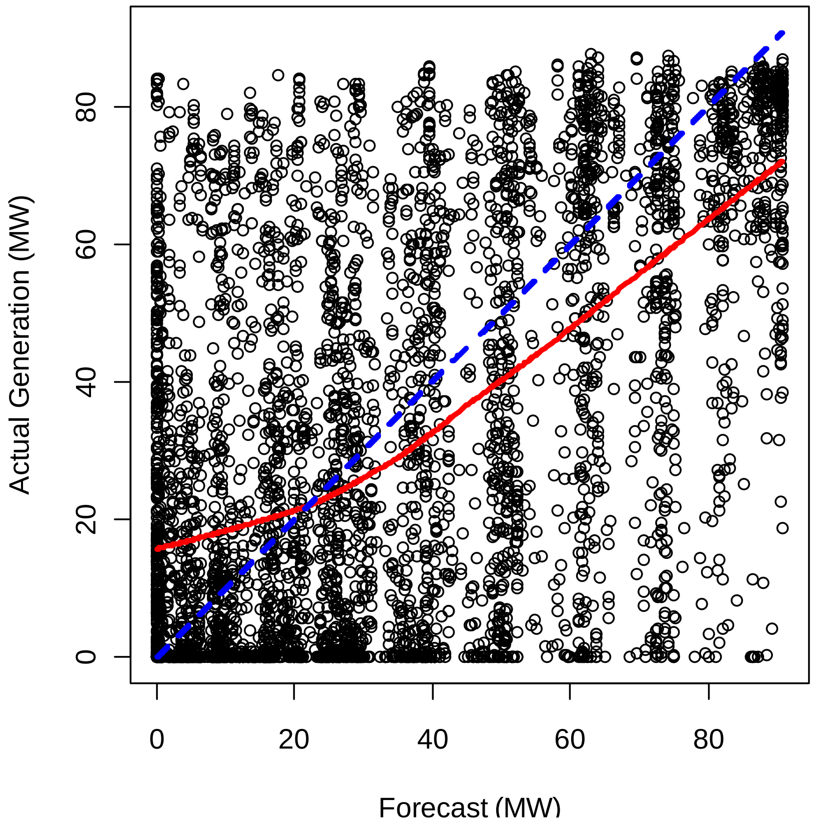


Figure 12 - Te Apiti eight hour energy

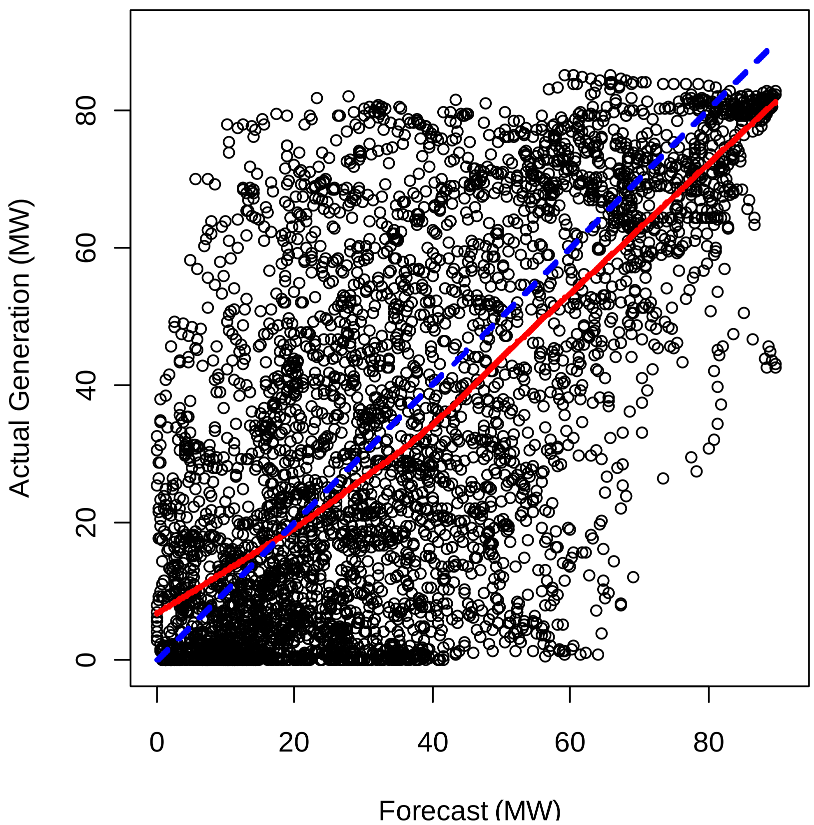


Figure 13 - Te Rere Hau half hour energy

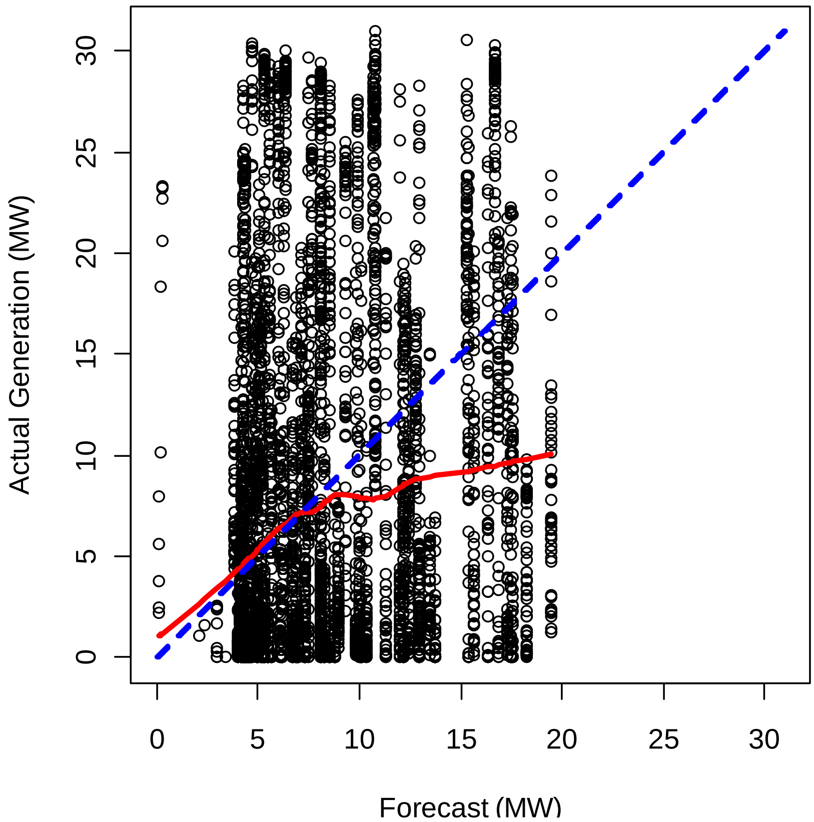


Figure 14 - Te Rere Hau eight hour energy

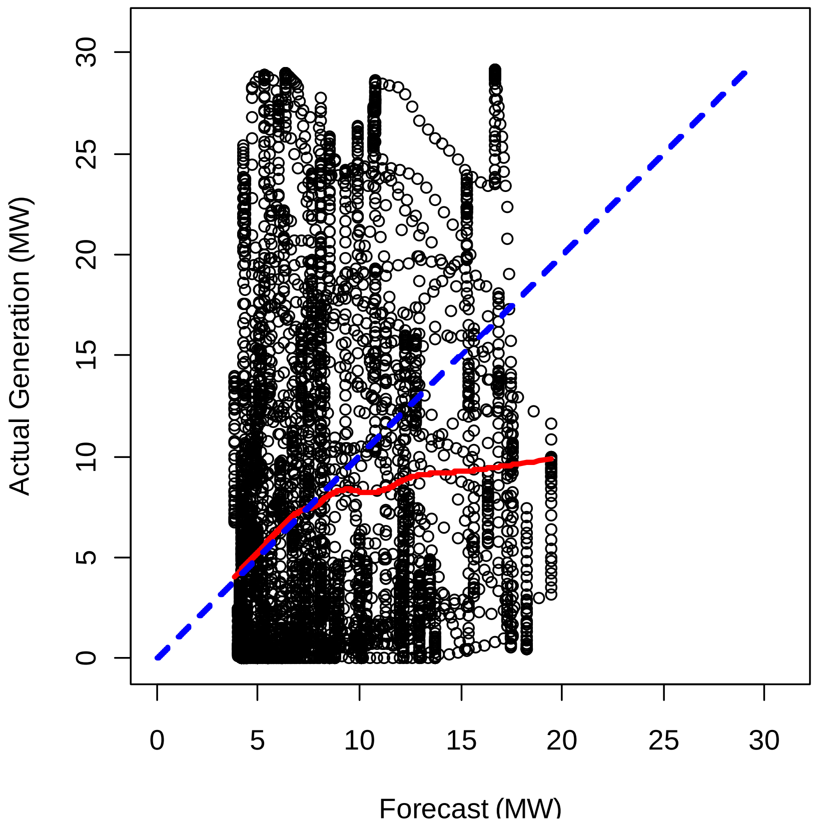


Figure 15 - White Hill half hour energy

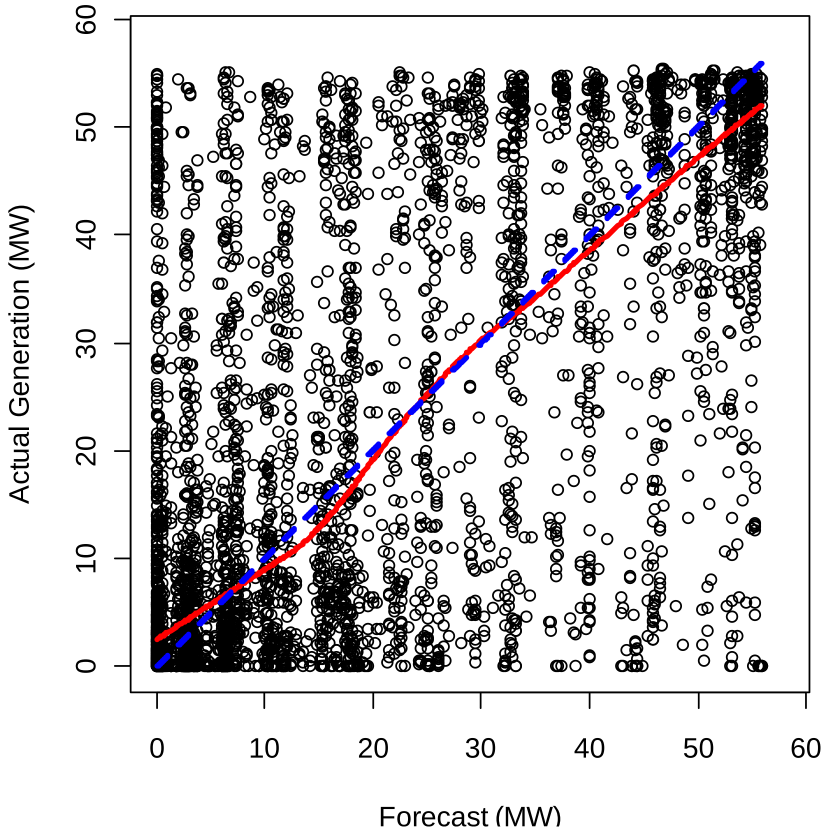
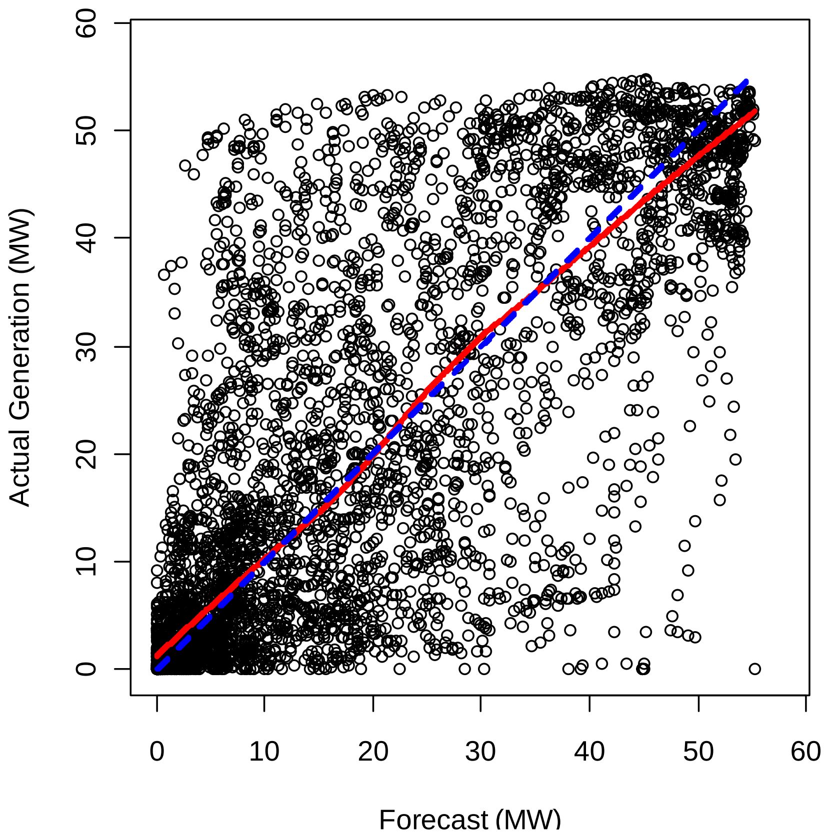


Figure 16 - White Hill eight hour energy



4. Comparison of best fit curves

Figure 17: Comparison of best fit curves from half hour energy charts

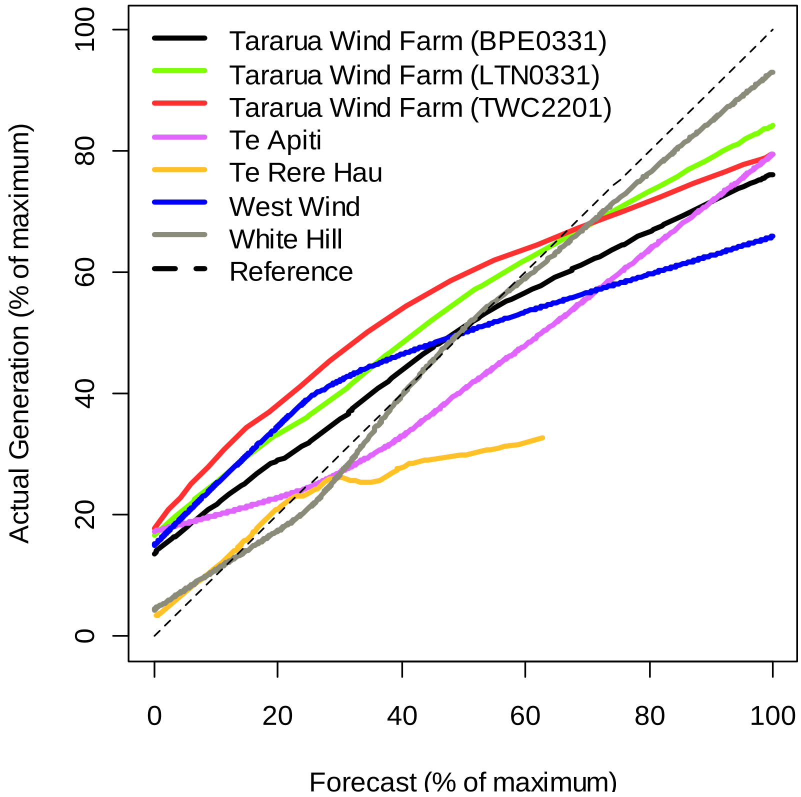
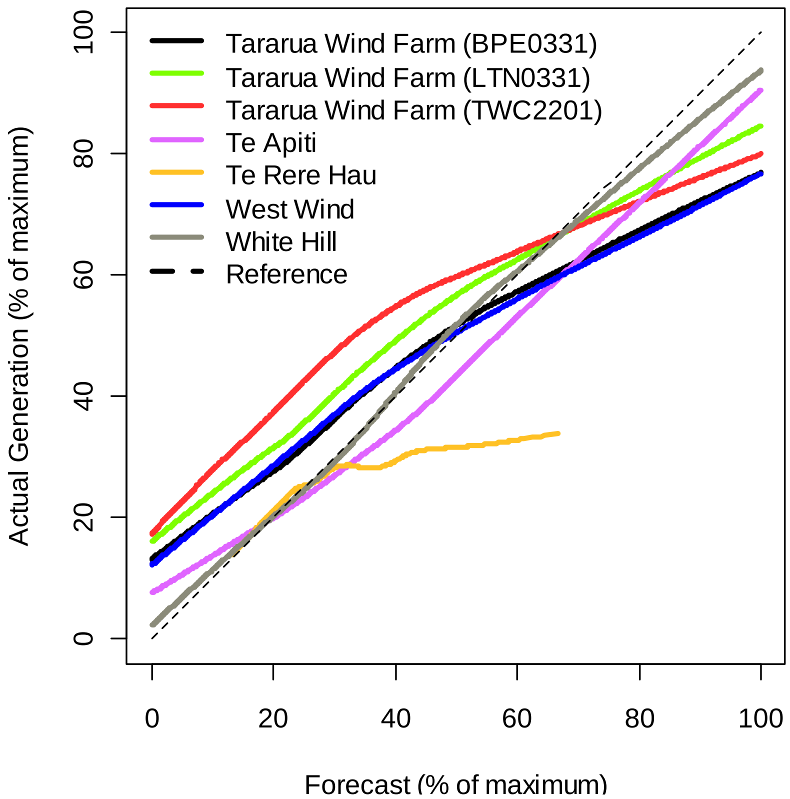


Figure 18: Comparison of best fit curves from eight hour energy charts



5. Technical appendix

Data sources

Forecast information: Forecast information is sourced from wind farm offers. All wind farm offers consisted of a single band offered at a price of $0.01/MWh. Offer data was obtained from Transpower.

Actual generation: Data for actual generation from offered wind farms was obtained from two separate sources. For Te Apiti and West Wind, metered data was obtained from Transpower. For the other wind farms, reconciled generation data was obtained from the clearing manager. Metered data from Transpower was preferred where it was available because it is considered more likely to reflect the data used in the final pricing schedule.

West Wind

Offers for West Wind are split between two nodes; WWD1102 and WWD1103. Actual generation from those two nodes is also available by node. However, the analysis is presented for West Wind by summing across those two nodes.

Half hour energy charts – forecast generation

For each trading period in the sample a time T was determined by subtracting six hours from the trading period start time. The latest forecast (relating to the trading period) submitted prior to time T was used. Note that this means the forecast is formed *at least* six hours prior to the trading period. It may in fact have been formed many hours before that.

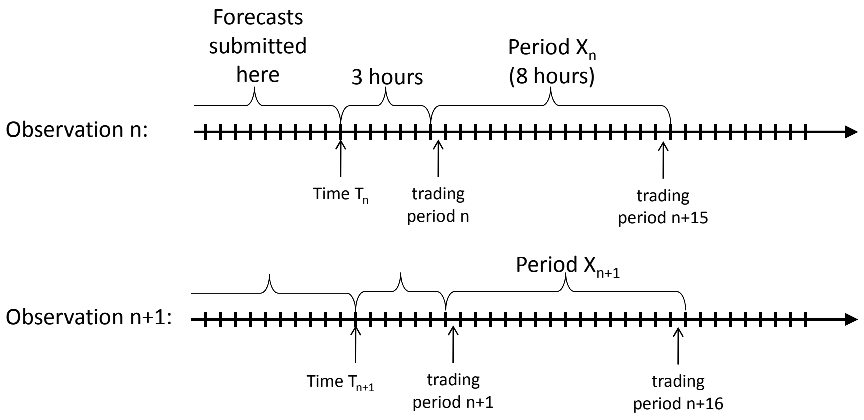
Eight hour energy charts

For each trading period in the sample, a period X was defined consisting of that trading plus the following 15 trading periods (8 hours). Actual generation (in average MW) was determined for period X.

For each trading period (and associated period X), a time T was determined by subtracting three hours from the beginning of period X. For each trading period in period X, the latest forecast available at time T was determined. Those forecasts were aggregated and expressed in average MW.

This process is illustrated in Figure 19.

Figure 19: Illustration of preparation of eight hour energy charts



Note that wind generators are required by the Electricity Industry Participation Code 2010 (Code) to submit persistence-based forecasts for a trading period within the two hours before the beginning of that trading period. Some generators use a persistence-based method for a longer time like three hours; that is, their offers for trading periods beginning within three hours of the offer submission will contain persistence-based forecasts. The three hour figure has been used in the analysis (to determine time T) to effectively exclude persistence-based forecasts from the analysis.

The eight hour period (the length of period X) is the longest period for which forecast data is required to be available. Generators are required to submit, by 1pm, a forecast of generation for each trading period in the following day, so with the three hour period used to determine time T, the Code effectively requires that a further eight hours of forecast data must be available at all times.

The eight hour period also appears to be both short enough and long enough to be reasonably relevant for commitment decisions for slower starting thermal generation and hydro river management in New Zealand.

Line of best fit

The best fit line is a lowess curve. It illustrates for each forecast level the best fit level of generation determined on a least squares basis. The lowess curve assumes no particular global functional form.

Contact details

If you have any questions about this data, please contact Laurie Counsell at the Electricity Commission on +64 (4) 460 8872 or e-mail laurie.counsell@electricitycommission.govt.nz.