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| <b>To</b>      | Tim Street, Laurie Counsell – Electricity Commission |
| <b>From</b>    | Shelley Nixon, Shane Dinnan – M-co                   |
| <b>Date</b>    | 27 June 2006   |
| <b>Subject</b> | <b>19 June 2006 Final Prices</b>                     |

## Summary of issue

- Provisional prices from 19 June were published on 20 June. The following sample of prices were observed:

| <u>Period</u> | <u>OTA2201</u> | <u>HAY2201</u> | <u>BEN2201</u> | <u>NI 6s</u> | <u>NI 60s</u> | <u>SI 6s</u> | <u>SI 60s</u> |
|---------------|----------------|----------------|----------------|--------------|---------------|--------------|---------------|
| 31            | 92.15          | 87.25          | 82.26          | 0.32         | 4.94          | 0.00         | 0.00          |
| 32            | 97.62          | 92.33          | 85.45          | 4.49         | 4.94          | 0.00         | 0.00          |
| 33            | 119.90         | 113.06         | 108.54         | 4.49         | 40.35         | 0.00         | 0.00          |
| 34            | 201.92         | 189.17         | 176.24         | 130.00       | 98.25         | 0.00         | 0.00          |
| 35            | 50,069.73      | 45,218.45      | 263.60         | 130.00       | 140,000.00    | 0.00         | 0.01          |
| 36            | 92,764.13      | 793.04         | 710.66         | 84.57        | 93,493.68     | 0.70         | 111.66        |
| 37            | 310.86         | 281.43         | 260.46         | 0.00         | 0.00          | 0.00         | 0.00          |
| 38            | 165.11         | 150.72         | 139.49         | 0.00         | 0.00          | 0.00         | 0.00          |
| 39            | 95.73          | 89.71          | 84.58          | 0.00         | 0.00          | 0.01         | 0.00          |
| 40            | 87.60          | 82.33          | 79.04          | 0.00         | 0.00          | 0.00         | 0.00          |

- Provisional prices were published containing the following infeasibilities:
  - Period 35, Deficit 6s North Island Reserve resulting in a \$140k published value;
  - Period 35, Maximum Limit MarketNodeConstraint for FK\_WKA\_MW+60 resulting in a \$130k unpublished value; and
  - Period 36, Deficit Generation at DAR, KOE, and KTA resulting in \$100k published values.
- The system operator investigated and resolved the infeasibilities on 22 June. The subsequent final price solution yielded the following price observations:

| <u>Period</u> | <u>OTA2201</u> | <u>HAY2201</u> | <u>BEN2201</u> | <u>NI 6s</u> | <u>NI 60s</u> | <u>SI 6s</u> | <u>SI 60s</u> |
|---------------|----------------|----------------|----------------|--------------|---------------|--------------|---------------|
| 31            | 92.15          | 87.25          | 82.26          | 0.32         | 4.94          | 0.00         | 0.00          |
| 32            | 97.62          | 92.33          | 85.45          | 4.49         | 4.94          | 0.00         | 0.00          |
| 33            | 119.90         | 113.06         | 108.54         | 4.49         | 40.35         | 0.00         | 0.00          |
| 34            | 201.92         | 189.17         | 176.24         | 130.00       | 98.25         | 0.00         | 0.00          |
| 35            | 1,109.81       | 1,007.91       | 263.60         | 130.00       | 2,707.83      | 0.00         | 0.01          |
| 36            | 10,654.82      | 9,392.86       | 8,421.76       | 130.00       | 10,100.86     | 0.02         | 7,649.79      |
| 37            | 310.86         | 281.43         | 260.46         | 0.00         | 0.00          | 0.00         | 0.00          |
| 38            | 165.11         | 150.72         | 139.49         | 0.00         | 0.00          | 0.00         | 0.00          |
| 39            | 95.73          | 89.71          | 84.58          | 0.00         | 0.00          | 0.01         | 0.00          |
| 40            | 87.60          | 82.33          | 79.04          | 0.00         | 0.00          | 0.00         | 0.00          |

4. The resulting price changes between the provisional price solution and the final price solution are as follows:

| <u>Period</u> | <u>OTA2201</u> | <u>HAY2201</u> | <u>BEN2201</u> | <u>NI 6s</u> | <u>NI 60s</u> | <u>SI 6s</u> | <u>SI 60s</u> |
|---------------|----------------|----------------|----------------|--------------|---------------|--------------|---------------|
| 31            | 0.00           | 0.00           | 0.00           | 0.00         | 0.00          | 0.00         | 0.00          |
| 32            | 0.00           | 0.00           | 0.00           | 0.00         | 0.00          | 0.00         | 0.00          |
| 33            | 0.00           | 0.00           | 0.00           | 0.00         | 0.00          | 0.00         | 0.00          |
| 34            | 0.00           | 0.00           | 0.00           | 0.00         | 0.00          | 0.00         | 0.00          |
| 35            | -48,959.92     | -44,210.54     | 0.00           | 0.00         | -137,292.17   | 0.00         | 0.00          |
| 36            | -82,109.31     | 8,599.82       | 7,711.10       | 45.43        | -83,392.82    | -0.68        | 7,538.13      |
| 37            | 0.00           | 0.00           | 0.00           | 0.00         | 0.00          | 0.00         | 0.00          |
| 38            | 0.00           | 0.00           | 0.00           | 0.00         | 0.00          | 0.00         | 0.00          |
| 39            | 0.00           | 0.00           | 0.00           | 0.00         | 0.00          | 0.00         | 0.00          |
| 40            | 0.00           | 0.00           | 0.00           | 0.00         | 0.00          | 0.00         | 0.00          |

5. On 22 June the Commission instructed the pricing manager under rule 3.28 of section V of part G of the Electricity Governance Rules to delay publication of final prices for 19 June pending further investigation.

## Infeasibility fixes implemented by Transpower

6. The grid owner/system operator made the following adjustments to the pricing input data to resolve the respective infeasibilities:
  - a. Period 35, Deficit 6s North Island Reserve resulting in a \$140k published value. **Adjustment:** NI Net Free Reserve 60s factor revised from 0MW to 2MW;
  - b. Period 35, Maximum Limit MarketNodeConstraint for FK\_WKA\_MW+60 resulting in a \$130k unpublished value. **Adjustment:** Constraint limits revised from 88MW to 0MW.
  - c. Period 36, Deficit Generation at DAR, KOE, KTA resulting in \$100k published values. **Adjustment:** UPPER\_NORTH\_ISLAND\_STABILITY\_W\_P\_A group equation constraint adjusted from 755 to 802 . NI Net Free Reserve 60s factor revised from 0MW to 23MW.
7. These adjustments were provided to the pricing manager on 22 June.

## System characteristics

8. As detailed in the above tables, final prices in period 36 are extremely high. Final prices in the period are the combined result of high demand, an effective shortage of "cheap" energy and reserve and the binding transmission constraint on MTI\_WKM1.1 due to an outage on MTI\_WKM2.1.
9. The following tables compare system characteristics on 19 June with those evidenced the previous Monday 12 June (acknowledging that NI demand on that day was artificially low due to the OTA substation outage):

| <u>12 June Period</u> | <u>Offered</u> | <u>NI Demand</u> | <u>SI Demand</u> |
|-----------------------|----------------|------------------|------------------|
| 31                    | 6,527          | 2,990            | 1,848            |
| 32                    | 6,553          | 3,089            | 1,873            |
| 33                    | 6,568          | 3,288            | 1,899            |
| 34                    | 6,728          | 3,483            | 1,941            |
| 35                    | 6,997          | 3,702            | 1,996            |
| 36                    | 7,039          | 3,925            | 2,026            |
| 37                    | 7,046          | 3,924            | 1,989            |
| 38                    | 7,075          | 3,864            | 1,974            |
| 39                    | 7,088          | 3,788            | 1,964            |
| 40                    | 7,080          | 3,745            | 1,953            |

| <b>19 June Period</b> | <u>Offered</u> | <u>NI Demand</u> | <u>SI Demand</u> |
|-----------------------|----------------|------------------|------------------|
| 31                    | 7,314          | 3,669            | 1,839            |
| 32                    | 7,312          | 3,744            | 1,860            |
| 33                    | 7,312          | 3,866            | 1,904            |
| 34                    | 7,334          | 3,976            | 1,991            |
| 35                    | 7,225          | 4,065            | 2,075            |
| 36                    | 7,179          | 4,227            | 2,100            |
| 37                    | 7,183          | 4,185            | 2,056            |
| 38                    | 7,225          | 4,093            | 2,002            |
| 39                    | 7,197          | 3,961            | 1,965            |
| 40                    | 7,198          | 3,904            | 1,939            |

| <b>Period Change</b> | <u>Offered</u> | <u>NI Demand</u> | <u>SI Demand</u> |
|----------------------|----------------|------------------|------------------|
| 31                   | 788            | 680              | -9               |
| 32                   | 760            | 655              | -13              |
| 33                   | 745            | 577              | 6                |
| 34                   | 606            | 492              | 50               |
| 35                   | 229            | 363              | 79               |
| 36                   | 141            | 302              | 74               |
| 37                   | 138            | 260              | 67               |
| 38                   | 151            | 229              | 28               |
| 39                   | 110            | 172              | 1                |
| 40                   | 119            | 159              | -14              |

## Price explanation

10. As an explanation of how the energy prices were derived in the SPD model, the WKM2201 node was used as an example. The final price at WKM2201 is \$9,724.47.
11. An equivalent of 1MW of demand was added at WKM2201 to determine the marginal plant in this period.

12. The increase in demand at WKM resulted in a system cost increase of \$9,724.47 comprising of:
  - a. \$7,166.89 for energy; and
  - b. \$2,557.58 for reserve.
13. This increase in cost was the result of the following redistribution of modelled energy and reserve outputs (including Excel rounding difference of (\$0.50):
  - a. 19.63MW of energy was backed off at "Gen A" saving \$1,080.44 (\$55.04 offer tranche);
  - b. 19.64MW of energy was increased at "Gen B" costing \$8,248.80 (\$420 offer tranche);
  - c. 19.63MW of 6s reserve was increased at "Res. provider A" costing \$2,551.90 (\$130 offer tranche); and
  - d. 19.63MW of 60s reserve was increased at "Res. provider B" costing \$4.71 (\$0.24 offer tranche).
14. Because of the binding transmission constraint of 246.3MW on MTI\_WKM1.1, available generation of approximately 125MW from MTI and WPA were unable to meet system demand. Prices of \$500 were therefore observed at these two islanded nodes.
15. the pricing manager is satisfied that the final prices for 19 June as calculated on 22 June are correct to the extent that:
  - a. the pricing process was performed correctly; and
  - b. The database was "refreshed" following advice from the system operator/grid owner that the infeasibilities identified earlier had been removed; and
  - c. There are no infeasibilities in the final pricing solve; and
  - d. To the best of our knowledge, the inputs provided under the rules by other parties which are required to perform the pricing process in accordance with the rules were present and correct.