

NEMMCO

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 Management Company Limited
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John Eastham
Executive Director
NECA

By Email to JEastham@neca.com.au

Dear John,

RE: Incident 14 March - Pelican Point Power Station

This letter is provided by NEMMCO in response to your request dated 31 August 2005 concerning the effect that the reduction in power output and subsequent tripping of generating units GT12 and ST18 at Pelican Point Power Station had on the amount of load shedding that took place in South Australia on 14 March 2005.

I need to advise that the opinions expressed in this letter are extrapolated from data supplied by third parties to NEMMCO and calculations made by NEMMCO using that data; they are based on NEMMCO's information, knowledge and belief and this document is provided in good faith.

It is emphasised that this letter details NEMMCO's opinions only, based on ex post calculations; there is no guarantee that the conclusions reached by NEMMCO would have occurred as the reality might have been quite different, and it is impossible to factor in all possible influences on power system operations on the day in question.

- 1 On 14 March 2005 at 06:39 hrs Australian Eastern Standard Time, there was a power system disturbance initiated by a transmission line fault near Davenport, South Australia.
- 2 As a consequence of that fault, two generating units at Northern Power Station rapidly reduced their output and the transmission lines connecting the South Australian and Victorian power systems opened approximately 2 seconds after the fault.
- 3 The disconnection caused the frequency of the South Australian power system to rapidly decrease and automatic load shedding facilities then disconnected load in stages at various locations in South Australia for the purpose of restoring the frequency to the normal value of 50 Hz. The last two stages of automatic under-frequency load shedding took place at 47.8 Hz (240 MW) and 47.6 Hz (14.5 MW).
- 4 During the course of the load shedding, the output of the gas turbine generating unit at Pelican Point power station (which had been generating 100 MW immediately prior to the fault) varied significantly and then shut down.
- 5 A question has arisen as to whether, and to what extent, the performance of Pelican Point power station affected the course of the load shedding.
- 6 Data recorded at Pelican Point power station by ElectraNet shows how the power output, voltage and frequency of the gas turbine generating unit varied after the fault.

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- 7 The lowest frequency measured at Pelican Point power station by ElectraNet was 47.611 Hz, at 4.52 seconds after the fault. At about this time, the gas turbine was disconnected and the final load shedding of 14.5 MW occurred. At this point, supply and demand were in balance and the frequency was momentarily steady at approximately 47.6 Hz.
- 8 If the Pelican Point gas turbine had not shut down from 100 MW, and if 100 MW of the load had not been shed, supply and demand would have also been approximately in balance (subject to small differences in load relief and governor response) at a higher frequency level. NEMMCO has assessed that under these circumstances, the frequency would have been just below 47.8 Hz.
- 9 Had the Pelican Point gas turbine not shut down from 100 MW, then just before the frequency reached 47.8 Hz the power system would have been out of balance by $240 + 14.5 - 100 = 154.5$ MW. As this imbalance is more than half of the imbalance that actually occurred at this frequency level (254.5MW), the frequency would have been falling at a rate at least equal to approximately mid-way between the actual rates of fall before and after the shedding at 47.8 Hz. This is estimated from the ElectraNet data to be 0.75 Hz/second. The operating time of this load shedding is determined from the same records as 0.2 second, in which time the frequency would have reduced by about $0.2 * 0.75 = 0.15$ Hz. As this is larger than the expected range of settings of the relays, it is most likely that the whole load block at 47.8 Hz would have been shed whether the Pelican Point gas turbine unit would have tripped or not.
- 10 If the Pelican Point gas turbine had not shut down, it is possible that the last 14.5 MW of load actually shed at about 47.62 Hz might not have been shed because the frequency would not have reached this level.

Yours sincerely,



Chris Deague

Head of System Operations Planning & Performance