



# **System Operator**

## **Huntly Unit 5 Commissioning**

### **Information Overview Document**

**November 2006**



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## 1. Purpose

This paper provides an overview of the changes required to the System Operator's scheduling and dispatch process to enable the commissioning of the new unit 5 generating unit at Huntly. It sets out the technical and operational changes required to enable the System Operator to plan to comply and comply with its principle performance obligations during commissioning, and the effect of those changes on participants.

The System Operator will be holding an industry briefing session in November 2006 that will explain the subject matter in this paper in more detail. Participants will have the opportunity to ask questions at that session.

## 2. System Operator's role in Commissioning

The System Operator has the obligation to act as a reasonable and prudent system operator: with the objective of:

- dispatching assets in a manner which avoids cascade failure
- maintaining frequency in the normal band (in accordance with the frequency objective in schedule C6), managing frequency during momentary fluctuations, and limiting frequency excursions.

The commissioning of an additional 400MW onto the power system creates additional risks to the system that the System Operator will be required to manage. The paragraphs below describe the System Operator's approach to managing system security during the commissioning, while at the same time, expediting the commissioning process.

## 3. Huntly Unit 5 Commissioning

Genesis Power Limited ('Genesis') is to commission a 385 MW Combined Cycle Gas Turbine Huntly generating unit (Huntly Unit 5). The new unit is planned to be connected to the grid in mid December 2006, with commissioning tests planned from 14 December until mid March 2007.

Huntly Unit 5 is the largest single shaft generating plant ever commissioned in New Zealand at one time. As with the commissioning of all new assets the asset capability (including under-frequency capability) is not able to be confirmed until testing has been carried out. Therefore, the System Operator cannot, as a reasonable and prudent system operator, rely on Huntly Unit 5's ability to remain connected during a frequency disturbance until it successfully carries out frequency stability testing. Due to the potential impact on the system if Huntly Unit 5 were to trip in such circumstances, the System Operator will treat Huntly Unit 5 as a secondary 'risk of trip' i.e. if there is a tripping of another generating unit or one or both poles of the HVDC link, Huntly Unit 5 is assumed to trip as a consequence of the sudden decrease in frequency. Such treatment is considered prudent to plan to comply with the principle performance obligations during commissioning of Huntly Unit 5.

This will be the case for the period of time until the plant's under-frequency performance has been demonstrated. Consequentially, the System Operator will temporarily change it's assessment of what constitutes a CE (contingent event) and an ECE (extended contingent event.) Such changes are necessary (and are provided for in the Policy Statement) to ensure system security is adequately maintained during commissioning. It is important that the industry is adequately informed of the impact of the commissioning on the system and the reserve procurement quantities.

The commissioning of Huntly Unit 5 will also require a number of system tests to be carried out. Such tests will be performed under a test plan in accordance with rule 2.6.1 of Technical Code A of the Electricity Governance Rules (EGRs).

## **4. Scheduling of Reserves**

### **4.1 Reserve Procurement Requirements**

The System Operator has identified three new credible events to add to the list of credible events listed in clause 12.1 of the Policy Statement in schedule C4 of the Electricity Governance Rules (EGRs). These events have been identified as potentially arising due to the behaviour of Huntly Unit 5 during commissioning. The additional credible events are:

- (i) the loss of the largest other generating unit plus Huntly Unit 5
- (ii) the loss of the single HVDC pole presenting the greatest risk plus Huntly Unit 5
- (iii) the loss of the HVDC bipole plus Huntly Unit 5.

Therefore, until Huntly Unit 5 frequency stability has been demonstrated (through frequency stability testing), the system operator intends to model Huntly Unit 5 as either a secondary CE or an ECE risk. Huntly Unit 5 will be considered a secondary CE risk until it has completed combustion tuning at the predetermined load and has completed a ride through test. A ride through test is where the system frequency is deliberately disturbed by approximately 0.5 Hz and is regarded as successful if the generator maintains stability.

While Huntly Unit 5 is considered to be a secondary contingent event risk, there must be sufficient reserve procured to cover the greatest of the additional credible events listed above.

Once Huntly Unit 5's under-frequency performance has been demonstrated, then when generating at or below levels to which it has already been commissioned, it will be treated as a secondary ECE risk. The System Operator considers such treatment to be the prudent course of action as well as one that best expedites the commissioning process, in the context of the New Zealand power system.

While Huntly Unit 5 is treated as a secondary extended contingent event (ECE) risk, there must be sufficient reserves to cover the greatest of:

- the loss of the largest generating unit
- the loss of the single HVDC pole presenting the largest risk
- a double generator trip (largest other generating unit + Huntly Unit 5), allowing for use of AUFLS
- the loss of the HVDC bipole plus Huntly Unit 5, allowing for use of AUFLS.

## 4.2 Reserve Modelling Options

The System Operator identified a number of potential solutions for modelling reserve requirements during the commissioning of Huntly Unit 5. These options are briefly described below:

- (i) Genesis could procure reserves directly from other providers to avoid reserve costs being allocated to participants. This was not considered viable because:
  - Genesis would not be able to accurately calculate the risk
  - the System Operator could not be sufficiently confident its PPOs would be met
  - the reserves would not be able to be dispatched or 'ring-fenced' for Huntly Unit 5
  - there may be insufficient reserves remaining for the balance of the system.
- (ii) Considering Huntly Unit 5 as a secondary CE throughout the commissioning. This option would result in the PPOs being met (without relying on AUFLS) and would be straight forward to implement. However, this option, in the System Operator's view, if implemented has the potential to result in a higher risk of reserve shortages, unnecessary cost for participants, and potential delays in commissioning.
- (iii) Changing the Scheduling, Pricing, and Dispatch (SPD) model formulation to have equations which could be activated to consider Huntly Unit 5 as a secondary CE or ECE risk. Such change was not considered practicable due to the time needed to perform the software changes and agree the changes (including to the SPD software specification) with the Electricity Commission and the industry.
- (iv) Changing the under-frequency targets in the RMT software to higher frequencies. Apart from being arbitrary, such change would not result in an accurate calculation of reserves and the System Operator could not be confident of its PPOs being met.
- (v) Requiring certain pre-existing system conditions for Huntly Unit 5 commissioning, to limit the amount of reserves that would need to be procured. The chances of the required conditions being present at the appropriate times would be a very onerous requirement and commissioning could be significantly delayed as a result.

- (vi) Setting up Huntly Unit 5 as two independent generating stations in RMT to model the two different under-frequency capability states during commissioning was considered and discounted. The outcome could result in unrealistic dispatch scenarios and system security problems, with Genesis being required to offer when Huntly Unit 5 was to be treated as a 'secondary' CE or an ECE risk as agreed with the System Operator. It would also not have been possible to model the reserves to the same standard as currently carried out by RMT.
- (vii) Deliberately dispatching a greater amount of reserves than required was not considered to be in participant interests due to high costs and a potential 'shortage' of reserves during commissioning.
- (viii) Relying on system co-ordinator manual scheduling through a spreadsheet or similar was not considered practicable, due to the lack of reproducibility in the solution and the potential for errors, leading to greater security risks and potentially higher costs.
- (ix) Making RMT front end changes to enable scheduling to recognise the different risks presented by Huntly Unit 5 to the system at different stages of commissioning. This option was considered the most prudent because:
  - the outcome would most likely allow the System Operator to meet its PPOs
  - the outcome would have the least amount of manual intervention
  - there would be an accurate quantity of reserve dispatched, maintaining the least cost dispatch principle
  - it was practicable to implement the changes in the time frame before commissioning.

### **4.3. Impact of Reserve Modelling Changes**

#### **4.3.1. Tool Changes**

The System Operator has therefore made some minor changes to the Reserve Management Tool (RMT), to enable it to:

- use a CE secondary trip model and an ECE secondary trip model for the same unit
- consider an AC unit as part of the ECE risk equation; currently only the HVDC bipole is considered to be an extended contingent event.

The RMT auditor will be asked to review and approve the changes. However, the changes are not a model formulation change and will not require a change to the System operator Service Provider Agreement.

### **4.3.2. Dispatch Constraints**

SPD does not explicitly allow for an AC unit to be considered as part of the ECE risk equation. To ensure the generation on the largest AC unit does not exceed the level for which reserves have been calculated by RMT, maximum generation constraints may need to be applied to generators in real time dispatch.

These maximums occur when:

- (i) Huntly Unit 5 is the largest AC CE risk and
- (ii) The AC ECE is the binding risk or if the generation went above the real time maximum constraint the AC ECE would become the binding risk.

The maximum generation levels will at least be the value from the last schedule of dispatch prices and quantities prepared prior to the start of the trading period. They are only applied to those generators which can set the risk in SPD.

### **4.3.3. Pricing**

Where generation is constrained to a quantity less than the cleared quantity in final pricing, the final pricing schedule will not reflect the constraint. This situation is similar to that which currently exists for a bona fide generation reduction by a generator in real time.

## **4.4. Operational Procedures**

The System Operator has put in place specific operational processes to manage the commissioning of Huntly Unit 5. Participants should note the following:

- there may be times when the System Operator will need to apply constraints in dispatch to risk-setting plant (other than Huntly Unit 5) to ensure their generation does not exceed the level for which reserves have been calculated by RMT
- the System Operator will not zero the RAFs when there is a shortage of energy while operating with Huntly Unit 5 as a secondary CE risk; this would be a departure from clause 23.1 of the Policy Statement and would be reported to the Electricity Commission in accordance with rule 13.2 of section II of Part C
- the System Operator may need to reduce generation from Huntly Unit 5, in real time, in some circumstances such as:
  - (i) if there are insufficient reserves to cover the risk
  - (ii) if there is too much generation on the system.

#### **4.5. Reserve Information Publication**

The Pre-dispatch Schedule published by the System Operator will provide industry participants with the expected largest reserve risk in each island and the instantaneous reserve levels for each island.

The Schedule of Dispatch Prices and Quantities (SDPQ) will provide participants information about their scheduled generation.

The System Operator is of the view there is sufficient information in the published schedules for participants to make appropriate decisions. The System Operator does not believe the EGRs allow it to publish any more specific information within gate closure (such as information relating to the commissioning intentions of Genesis Energy).

#### **4.6. Compliance and Cost Allocation**

The allocation of reserve costs will be performed in accordance with rule 11 of section IV of part C.

### **5. System Tests**

The System Operator will use Customer Advise Notices (CANs) to notify market participants at the following points of commissioning Huntly Unit 5.

#### **5.1 Initial Synchronisation**

A CAN will be distributed the day-ahead of the planned first synchronisation. The CAN will indicate a window in which the first synchronisation is planned to occur. For example, between the hours of 10:00hrs and 15:00hrs.

Any material change will be advised by the System Operator.

#### **5.2 Planned System Ride through Tests (SRT)**

A CAN will be distributed the day before the planned SRT. The CAN will indicate a window for carrying out the SRT.

Any material change will be advised by the System Operator.

#### **5.3 Drop Load Testing**

On the day ahead of the planned drop load test the System Operator will release a CAN advising industry participants of the window for carrying out this test.

Any material change will be advised by the System Operator.

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## 5.4 End of Commissioning

The System Operator will advise market participants when, from an operational perspective, Huntly Unit 5 commissioning ends and Huntly Unit 5 will be regarded as a normally operating generator.

The System Operator will communicate all Grid Emergency Notices, Warnings Notices, and CANs using its normal processes.

## 6. Commissioning Plan

The System Operator and Genesis Energy are currently in the process of agreeing commissioning and test plans under rule 2.6 of Technical Code A.

## 7. Further Information

The System Operator is holding an industry briefing sessions to provide further information about the processes it will use for commissioning of Huntly Unit 5. This will last approximately two hours and will be held in Wellington on **20 November 2006**.

Participants are also welcome to contact the System Operator with additional questions at [system.operator@transpower.co.nz](mailto:system.operator@transpower.co.nz).