ELECTRICITY COMMISSION

Consultation Paper:

High Spring Washer Pricing

19 May 2006

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Introductory Material

Introduction

Constraint prices

1. The New Zealand wholesale electricity market uses a pricing system called locational marginal pricing (sometimes known as nodal pricing), which uses the marginal cost of generating the next unit of electricity as the basis for calculating prices. The locational marginal price includes the marginal price of both generating the electricity and transporting it to each location. The locational marginal price will be affected when transmission security constraints begin to bind and higher priced generation must be dispatched.

2. The purpose of the locational marginal price is to:
   a. allow generator investors to make appropriate locational investment decisions;
   b. allow purchasers to make appropriate locational investment decisions;
   c. encourage appropriate real-time consumption decisions based on price; and
   d. allow efficient real-time dispatch of available generation resources.

3. When a transmission security constraint begins to bind[1], price separation can arise as a result of the need to dispatch higher priced generation on the downstream side of the constraint. In other words, the nodal prices reflect the effect of the constraint on the ability to deliver energy to either side of the constraint. Prices on the upstream side of the constraint reflect the lower cost of generation in the non-constrained region, while prices on the downstream side of the constraint reflect the higher cost of generation in the constrained region.

4. A special case of transmission security constraint pricing is the 'spring washer' pricing effect that occurs when a constraint occurs within a transmission loop. A fuller explanation of transmission security constraint pricing and the spring washer pricing effect is given in Appendix 5. The spring washer effect can cause prices in the constrained region to be many multiples higher than the marginal generator price.

Confidence in final prices

5. Final prices are calculated using the Scheduling Pricing and Dispatch Model (SPD). SPD uses a large number of variables and parameters as part of the process for calculating prices.

6. Small changes in the values of the variables or parameters ('input data') can lead to significant changes in final prices.

7. When minor input data inaccuracies lead to high spring washer price effects, the Electricity Commission (Commission) considers the high spring washer prices should be tested for their accuracy before becoming final. The Commission considers it is important that participants have confidence in the accuracy of any high spring washer

[1] A transmission security constraint binds when the flow through the line equals the security limit on that line. The security limit is determined by the system operator, based on security criteria including the ability to withstand a single contingent event. That is, if any one line fails, the remaining lines must be able to safely carry the resulting increased current until the system operator can safely re-dispatch to account for the problem.

prices appearing in final prices. Otherwise, the real-time production and consumption and longer term locational investment processes that derive from locational prices could be distorted by inaccurate data, and result in inefficient decisions[2].

Background

Undesirable trading situation

8. A participant alleged that an undesirable trading situation existed in relation to high prices for the 1730-1800 trading period on 24 April 2004. The Commission's investigation into the breach allegation showed that these prices were due to high spring washer price effects. A project was established to investigate the pricing process in these high spring washer price situations.

Constraint issues group

9. The Constraint Issues Group (CIG) was formed to investigate these high spring washer price situations and advise on whether any changes to the Electricity Governance Rules 2003 (Rules) are needed.

10. The CIG focussed on ensuring that, when high spring washer prices occur, participants can have confidence that these prices reflect 'real world' dispatch processes.

11. The CIG prepared a report for the Commission on constraint pricing in accordance with its terms of reference. The terms of reference and reports for the CIG are available on the Commission's website at:

    http://www.electricitycommission.govt.nz/advisorygroups/pjtteam/cig/index [3].

12. The Wholesale Market Advisory Group (WMAG) considered the CIG report and advised the Commission that the Rules should be amended to ensure that final prices are robust against any minor measurement inaccuracies in input data in such high spring washer price situations.

13. In response to the recommendations from the CIG and the WMAG, the Commission requested the system operator to further investigate the issues and identify mechanisms that could be used to address the concerns identified. Following investigation, the system operator examined several potential solutions and recommended a preferred approach to the WMAG at its meeting on 21 July 2005[4].

14. The solution proposed by the system operator tests the sensitivity of high spring washer prices to variations in the key input parameters, which reflect the likely level of input data measurement tolerances. This proposed solution forms the basis for the rule change proposals outlined in this consultation paper.

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[2] Final prices are calculated after real time and do not directly influence real-time production and consumption decisions. However, parties responding to real-time price signals need confidence that the final prices will be a reasonable reflection of what occurred in real time. Improving the "robustness" of the final pricing process increases confidence in real-time prices and that actions taken in real time will be reflected accurately in final prices.

[3] Note that the CIG terms of reference excluded a review of nodal pricing.

[4] See the papers "CIG Provisional Pricing Triggers" and "CIG Constraint Relief Solutions" presented to the WMAG meeting on 21 July 2005. These are on the Commission's website at: http://www.electricitycommission.govt.nz/advisorygroups/wmag/wmagmeetings/21July05

Related workstreams

15. In order to understand the role of the CIG, it is useful to understand the wider context of the CIG work and what it did, and did not, consider.

16. The brief of the CIG excluded a fundamental review of nodal pricing and its effectiveness in achieving the market design objectives. This was because there are several other workstreams that are separately addressing these broader market design issues. Some of these other workstreams are discussed below.

Market design report

17. A market design report was prepared for the Commission by the New Zealand Institute of Economic Research (NZIER). The report considered the priority with which the Commission should develop such market design issues as nodal pricing, zonal pricing and net pooling arrangements. These other tasks provide separate opportunities to review whether high spring washer prices provide appropriate locational investment signals[5].

Hedge market development

18. The Hedge Market Development Steering Group (HMDSG) is looking at ways to improve the energy hedge market and introduce a transmission hedge product. This will provide a mechanism by which participants can manage exposure to high spot prices that may still remain after constraints are relaxed for a high spring washer price situation.

Transmission workstreams

19. Several transmission workstreams, including the Grid Investment Test design and the consideration of transmission alternative procurement, are examining the effectiveness of nodal pricing as a locational investment signal.

Commission's approach

20. As a result of work being completed in other workstreams, the Commission considers it inappropriate to initiate a fundamental review of nodal pricing under the constraint issues work stream. Consequently, this paper does not consider issues associated with the effectiveness of nodal pricing, and instead focuses on the immediate concern of ensuring high spring washer prices are a 'robust' signal of actual constraints on the transmission system.

Rule change proposal

21. In response to the work completed by the CIG, the WMAG and the system operator, the Commission has developed a proposal to amend the Rules. The Commission now wishes to consult with interested parties concerning this proposal.

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[5] The NZIER Market Design Report is available on the Commission website at: http://www.electricitycommission.govt.nz/news/marketdesign

Purpose

22. The purpose of this paper is to:
    a. outline the rule change proposal;
    b. provide an analysis of the proposed rule change; and
    c. provide background information for interested parties to base their submissions on.

23. This paper includes a statement of proposal as required by section 172F of the Electricity Act 1992 (Act).

24. The proposed amendments to the Rules, set out in this consultation paper, consist of an integrated package of changes to the Rules on how final prices are to be set when high spring washer price conditions exist. This set of proposed rule changes is considered as one proposal (Proposal).

25. The Commission considers that the objective of the Proposal is unlikely to be satisfactorily achieved by any reasonably practicable means other than as recommended in the Proposal. The Proposal accordingly includes rule amendments required to implement the proposed changes.

Submissions

26. The Commission invites submissions on the Proposal and in answer to the specific questions contained in this paper by 5pm on Friday 30th June 2006. Please note that submissions received after this date may not be considered.

27. The Commission's preference is to receive submissions in electronic format (Microsoft Word) and to receive one hard copy of the electronic version. The electronic version should be emailed with 'High Spring Washer Pricing' in the subject header to info@electricitycommission.govt.nz and one hard copy of the submission should be posted to the address below.

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28. The Commission will acknowledge receipt of all submissions electronically. Please contact Jenny Walton if you do not receive electronic acknowledgement of your submission within two business days of sending your submission.

29. Submissions should be provided in the format shown in Appendix 4. Your submission is likely to be made available to the general public on the Commission's website. Submitters should indicate any documents attached, in support of the submission, in a covering letter and clearly indicate any information that is provided to the Commission on a confidential basis. All information provided to the Commission is subject to the Official Information Act 1982.

Abbreviations used in this paper

Act	Electricity Act 1992
CIG	Constraint Issues Group
Commission	Electricity Commission
FTR	Financial transmission right
GPS	Government Policy statement
HMDSG	Hedge Market Development Steering Group
HSWPS	High spring washer price situation
IR	Instantaneous reserve
Minister	Minister of Energy
NPV	Net present value
NZEM	New Zealand Electricity Market
NZIER	New Zealand Institute of Economic Research
Proposal	The high spring washer pricing rule change proposal
Rules	Electricity Governance Rules 2003
SPD	The Scheduling, Pricing and Dispatch model used by the system operator to manage the electricity system
Trading period	The half-hour period in real time when trading of electricity and reserve occurs
WMAG	Wholesale Market Advisory Group

Analysis

High spring washer pricing

30. Power flows through the transmission system according to the laws of physics (Kirchoff's laws in particular). The transmission system includes many parallel paths, for security. These parallel paths can form loops within the transmission system and power flows will split across parallel paths according to the impedances on each side of the loop. If one side of the loop is weaker than the other the system operator will need to re-dispatch generation to avoid overloading this weaker link. This weaker link is referred to as a transmission constraint[6] and the re-dispatch of generation, to avoid overloading this link, will impact on the marginal price of supplying electricity at each point around the loop. In particular, price separation will occur either side of this transmission constraint.

31. This price separation arises because of the need to dispatch up higher priced generation on the downstream side of the constraint, and dispatch down lower priced generation on the upstream side of the constraint. In some situations, constraints result in complex pricing situations, commonly called the 'spring washer effect'. The prices that result from such constraints can be very high and very sensitive to minor variations in input data. Appendix 5 gives a worked example of a simple spring washer price effect. In practice much more complex and interlinked loops and resulting spring washer prices can arise.

32. For participants to have confidence in final prices, they need to be confident that high spring washer prices reasonably reflect what happened in reality, and are not a result of input data measurement inaccuracies (for example, metering data measurement inaccuracies, transmission impedance data measurement inaccuracies, or security constraint calculation inaccuracies).

33. The Commission accepts that some level of inaccuracy in input data to the pricing process is inevitable. A level of input data inaccuracy is accepted in order to achieve timely final pricing outputs and the Rules recognise this by allowing estimation of metering data.

34. However, when situations arise where minor changes in input data lead to major changes in prices, then a check on the robustness of the price is required. Robustness in this instance refers to ensuring prices are not sensitive to minor measurement inaccuracies in the input data.

35. High spring washer prices can lead to situations where prices are very sensitive to minor changes to input data. This Proposal aims to detect such situations and provide participants with confidence that such high prices are not due to input data measurement inaccuracy. This involves detecting any high spring washer pricing situations and relaxing the key input variable (transmission constraint) by the tolerance of the input data measurement inaccuracies, and using the revised input data to calculate final prices.

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[6] More correctly these should be referred to as "transmission security constraints" as they are constraints on the transmission system imposed by the system operator to protect the security of the overall power system. For simplicity these are sometimes referred to as simply "constraints".

Timeliness versus accuracy of final prices

36. The final pricing process is a trade off between the accuracy of the final prices and the timeliness of producing final prices. At the start of the New Zealand Electricity Market (NZEM) in 1996, final prices were produced at the end of the month. This allowed the relevant parties plenty of time to collect accurate data and correct any errors. In 2001, the market collectively voted to move to produce final prices in a more timely fashion and accepted the necessary reduction in accuracy of the input data to achieve this.

Dispatch and pricing differences

37. Economic theory suggests that the most efficient settlement price is one that perfectly reflects the marginal cost of supplying the next unit of energy from the dispatch outcome. That is, the dispatch and final pricing processes should, if possible, perfectly align.

38. In practice, this can never be fully achieved because the two processes use different sets of input data, neither of which is perfect. Dispatch prices are calculated for each 5-minute period using SCADA data[7], whereas final prices are calculated for each half-hour period using actual metering information.

39. In addition, the dispatch process may not perfectly reflect physical reality. For example, the dispatch model may be based on certain assumptions about the impedance and thermal limits of transmission lines. These assumptions may not perfectly reflect reality. Therefore, a dispatch solution that re-balances generation because of an assumed limit on a critical line may not reflect the actual flow on that line.

Constraint price sensitivity

40. For the vast majority of cases the minor differences between the input data for dispatch and pricing result in very minor differences in pricing outcomes. However, when transmission security constraints bind[8] in SPD, a small change in input data can lead to a very large change in pricing results.

41. The example in Appendix 5 shows how spring washer prices are dependent on the measured load at each node, the way flows split between parallel lines (due to the impedance of the lines) and the value of any transmission security constraint.

42. For example, if the actual impedance of the lines was slightly different to modelled impedance then the flow split around the loop may be different, the transmission security constraint may never bind, and no constraint price may arise at all.

43. All these values are determined from measurements. By nature all measurements are imperfect and are subject to measurement tolerances. These tolerances are part of the measurement process and can never be completely eliminated. Therefore, any minor difference between the 'true' value of these inputs and the measured values can lead to large price differences.

44. Some people are critical of prices in constrained regions that increase to a figure many times the highest offered generator price that cleared. However, the example in

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[7] SCADA data is the data produced using Transpower's Supervisory Control and Data Acquisition system, which monitors the generation and load at each market node.

[8] Transmission security constraints are always present in SPD but only impact the dispatch and price when the limits imposed (the constraint) is reached and the constraint "binds".

Appendix 5 shows that the spring washer prices are made up of multiples of generation offers, and include the value of more expensive generation (less the cost of cheaper generation being backed off) that is required to provide the next marginal unit into the constrained region.

Problem definition

45. The nature of locational marginal pricing means that high locational prices can occur when transmission security constraints occur (constraint prices). These locational prices are an important part of the New Zealand market design as they provide locational pricing signals for generator investment decisions, consumer locational investment decisions, and real-time production and consumption decisions. The Commission wants to ensure the market based generator investment decision process is based on reliable price signals that reflect the physical reality of the system.

46. However, constraint prices can lead to very high purchaser prices, for example, where the purchaser is paying a price that is more than five times the highest cleared generator offer price. When such high spring washer prices occur, participants need to have confidence that they are robust in the sense of being a reflection of actual physical system conditions.

47. It is also important that final prices are produced in a timely manner. To ensure such timeliness, the Rules allow a degree of estimation in the pricing process. This estimation can lead to minor inaccuracies in the input data for final pricing. However, the nature of spring washer prices is that they are very sensitive to such minor inaccuracies in the input data.

48. For participants to have confidence in final prices it is necessary to ensure that such high spring washer prices are robust in the sense of not being unduly influenced by minor inaccuracies in the inputs to the pricing process. That is, any high spring washer prices should be tested to ensure participants can have confidence that they are outside the range that could have been caused by input data inaccuracies.

49. In addressing this issue, the Commission recognises the necessary trade-off between the timeliness of final prices and the accuracy of final prices. Participants have already accepted that, in order to obtain timely prices, a degree of estimation and possible inaccuracy of input data is required. The Commission has therefore focussed on ensuring that, when the final price schedules do include high spring washer prices, these are tested to ensure they are outside the range of likely input inaccuracies.

Q1 *Do submitters agree with the problem definition as stated above? If not, then why not, and what alternative problem definition would you propose?*

Summary of proposed rule amendments

Objective of the Proposal

50. The overall objective of the Proposal is to provide improved certainty that final prices are based on robust input data.

51. The proposed rule amendments are discussed below.

High spring washer pricing

52. The proposed changes require the pricing manager to review all prices before they become final to detect any high spring washer prices. Although spring washer prices can be difficult to detect, high spring washer prices have been defined as being when the highest nodal price is more than the trigger ratio value multiplied by the highest cleared generator offer price in the pricing schedule. Following a study of historic pricing data, the trigger ratio value is proposed to be initially set at five, and could be reset by the Commission if required.

53. The proposed changes require the pricing manager to notify the system operator when it detects a high spring washer price during the final pricing process. The system operator will then review the transmission security constraints that led to this price and, if appropriate, relax the constraints[9] by the greater of either 1MW or 1% of the constraint value. The relaxed transmission security constraint value will then be used to calculate final prices[10].

54. It is noted that relaxing the constraint by 1MW or 1% may not relieve the high prices. However, the relaxation of constraints using this mechanism will provide confidence that such prices are a reasonable reflection of a physically dispatchable solution.

Defining a high spring washer price situation

55. Because spring washer price situations can be quite complex, and high prices can arise from other reasons, such as a shortage of reserve etc, it is difficult to define a perfect test for when a high spring washer price situation exists. Ideally the test should be simple so that it can be implemented reliably but robust so that it neither misses genuine high spring washer price situations nor falsely triggers the process for situations that are not high spring washer price situations.

56. The Proposal involves a delicate balance between ensuring locational prices are robust and not undermining the value of genuine locational pricing signals. The key to setting this balance lies in defining when a high spring washer price situation exists. Too broad a definition could cause genuine locational price signals to be blunted and too narrow a definition could cause false price signals that are not based on robust input data.

57. The core of the proposed definition of a high spring washer price situation relies on the ratio of the highest nodal energy price to the highest cleared offer. This definition is simple to implement but could be distorted by a number of factors that could distort either the highest cleared offer or the highest energy price. The Commission has identified the following factors that could impact on the highest energy price or the highest cleared offer and hence distort the high spring washer price situation:

Frequency keeping constrained on distorts highest cleared offer

58. When a generator is providing frequency keeping it may be constrained on to an offer band above the highest energy price. This could mask a high spring washer price situation by setting a highest cleared offer above that solely due to providing energy requirements.

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[9] In the case of more than one transmission security constraint affecting the constraint price (for example, parallel transmission lines) then all the relevant constraints will be relaxed by the same amount.

[10] The review process also provides an opportunity for the system operator to ensure any security constraints, which led to high spring washer prices, have been correctly applied.

59. The Commission proposes to deal with this possible problem by including a test that the highest cleared offer is not 'constrained on'. This test is reasonably simple to implement and will avoid the possibility of frequency keeping requirements masking a genuine high spring washer price situation.

Energy price and cleared offer in different islands

60. If the highest cleared energy price and the highest cleared offer are in different islands then they may not be related to the same spring washer price. This could cause a false triggering of a high spring washer price situation, and thus slightly undermine price integrity by relaxing a constraint, and reducing average purchaser prices, slightly when it was not necessary to do so.

61. The Commission considered whether this problem could be easily overcome by a simple test of location of high prices and high offers. It was concluded that a simple test could not be implemented as the problem propagates down to smaller and smaller regions. That is, price 'islands' can occur anywhere in the system, so it is not practical to differentiate down to increasingly small areas of location of high prices and high offers.

62. The Commission has therefore, in this instance, opted for simplicity of the test for a high spring washer price situation over accuracy. It is acknowledged that this approach could lead to a small degree of unnecessary price reduction but the Commission considers this level of inaccuracy should be relatively small, as such price islanding is relatively infrequent.

Reserve price impacts on energy price

63. If reserve prices are high and a generator is providing both partially loaded spinning reserve and energy then the reserve price could impact on the energy price and create a false measurement of whether or not a high spring washer price situation exists.

64. That is, a high reserve component of the energy price could trigger a false high spring washer price situation. Again this would slightly undermine price integrity as a false trigger will lead to unnecessary relaxation of a transmission constraint.

65. The Commission considered whether it would be possible to address this issue by a simple test of the reserve component of energy price. Discussions with the system operator showed this was not possible with the current pricing and dispatched software.

66. The Commission has therefore accepted this limit of the proposed test and acknowledges it could lead to a slight degradation of the integrity of the pricing process by falsely triggering high spring washer price situations. However, in practice this is likely to be very minor as situations where the reserve price component of the energy price is more than 5[11] times the energy offer component are very rare.

Multiple constraints

67. If multiple transmission constraints exist in the same trading period it could be difficult to determine which of these drove the high spring washer price situation.

[11] The initial proposed high spring washer price situation trigger ratio is 5, this may be changed in accordance with the process laid down in the proposal.

68. The Proposal deals with this problem by only relaxing the transmission constraint with the highest constraint price. This constraint will be the one which will have the greatest overall impact on purchaser prices. The 'constraint price' of a constraint is derived from the pricing model and is a measure of the effect that relaxing the constraint will have on the objective function of the model. As the objective of the model is to maximise consumer benefit then the relaxing of the constraint will directly impact purchaser prices as lowering purchaser prices increases consumer benefit.

Summary

69. Ideally the high spring washer definition and the associated test would exclude all the above and hence avoid either masking or falsely triggering a high spring washer price situation.

70. The Commission considered each of the above and considered the extent to which they might mask or falsely trigger a high spring washer price situation versus the cost of refining the high spring washer test and consequent delays in processing this Proposal.

71. Overall the Commission considers it worthwhile refining the test to exclude frequency keeping constrained on offers and differentiate between different constraints[12] but not the other situations. This is because frequency keeping constrained on values are relatively high and occur more frequently than the other situations. The frequency keeping and instantaneous reserve issues are also discussed in slightly more detail in the section below on 'triggers'.

72. This situation could be reviewed once operational experience of the proposed rule change had been gained.

Q2 *Do submitters agree that only the frequency keeping constrained on situation is worth excluding from the definition of a high spring washer price situation?*

Q3 *If not, then what other situations do you consider should be considered? (Please provide evidence to support your response).*

Setting the trigger value

73. The system operator undertook research to determine the best trigger value. A copy of its report is available on: http://www.electricitycommission.govt.nz/pdfs/advisorygroups/wmag/pdfs21July2005/CIG-Provisional-Pricing-Triggers.pdf.

74. This study examined various possible triggers to indicate a high spring washer price situation. It tested these triggers against various historical pricing situations and considered their ability to both capture true high spring washer price situations and reject situations where the price was high for other 'genuine' reasons. It concluded that the ratio of the maximum nodal energy price to the maximum cleared energy offer price was the most reliable trigger[13].

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[12] Strictly speaking the ability to differentiate between different constraints is dealt with by the methodology for resolving a high spring washer price situation rather than the test of whether a high spring washer price situation exists.

[13] This was subsequently refined to be a "cleared and non-constrained on offer" to avoid frequency keeping constrained on offers masking a high spring washer price situation as discussed above.

75. Tests were then undertaken against a range of historical cases to determine the optimal value of the trigger ratio. These tests indicated that a value of five would be the best compromise between setting the trigger level so low as to cause excessive unnecessary provisional price situations and so high as to ensure all genuine high spring washer price situations are captured.

76. It is noted that the above tests can not perfectly predict future situations and any trigger value will not be perfect. The WMAG considered whether the trigger value should be able to be changed, if experience showed a different value would be better. The WMAG advised that this could best be achieved by allowing the Board to set the trigger value from time to time, without the need for the lengthy rule change process.

77. It is proposed that the precise value of the trigger 'X' would not be set in the Rules. Rather, it would be a variable that can be set from time to time by the Commission. The Commission considers the flexibility of allowing it to change this variable from time to time outweighs the benefits of transparency that might be achieved by having the trigger value set in the Rules.

Q4 *Do submitters agree that the trigger value should be set from time to time by the Commission rather than specified in the Rules?*

Effect on price

78. It is likely that, in a small number of trading periods, the proposed rule amendments will decrease energy and reserve prices in the short term. That is, they will ensure that high spring washer prices only occur where they are based on robust input data.

79. The proposed rule changes should also decrease energy and reserve prices in the longer term. That is, by ensuring locational generation investment decisions are based on robust data, the Proposal should increase the efficiency of the market investment decision process and maintain sustained downward pressure on prices.

Summary of reasonably practicable options

80. The objective of the Proposal is to ensure participants have confidence in the robustness of final prices, and that any high prices are not due to input data inaccuracies.

81. Two options for achieving this objective were considered:

    a. Detect high spring washer prices then relax the appropriate constraint; and

    b. Introduce price caps.

82. A brief overview of these considerations is provided below and more detailed analysis is provided in Appendix 1.

83. In addition, several sub-options for how to implement the proposed rule change were considered. These are also discussed below.

Constraint relaxation (preferred option)

84. One method of achieving the objective would be to ensure that final prices are 'robust' given the measurement tolerances of the input data. This is achieved by finding the data input that the price is most sensitive to and then relaxing this by a small step (ie

1MW or 1%, whichever is the greater). In the case of high spring washer prices, the parameter that price is most sensitive to is the transmission security constraint. This approach is therefore based on relaxation of the relevant transmission security constraint.

85. Under this option the pricing manager would review high final prices before being published to detect any high spring washer price situations. Extreme spring washer price situations are defined as where the highest nodal energy price is more than 'X' times the highest cleared generator offer price, and a transmission security constraint binds. 'X' is a value published by the Commission from time to time, after consultation with affected parties. When a high spring washer price situation is identified, the pricing manager will publish provisional prices and request the system operator to review the transmission security constraints. The system operator will identify the transmission security constraint causing the high price and relax it by the greater of either 1MW or 1%. The pricing manager will then publish final prices based on these revised constraint levels.

86. The advantage of this approach is simplicity and a high degree of confidence that final prices are based on input data that reflects the physical reality of the situation.

87. Another advantage is that some high spring washer prices may still occur in final prices when these represent a realistic dispatch outcome, for example, if relaxing the constraint does not relieve the high spring washer prices. In these cases, the high spring washer prices represent genuine transmission security constraints and provide appropriate investment signals consistent with the Commission's specific outcome (e) of ensuring "the full costs of producing and transporting each additional unit of electricity are signalled"[14].

Tightening or relaxing the constraint?

88. Within the constraint relaxation approach, two sub-options were also considered. These were whether to tighten or relax the constraint. Either approach would be valid as measurement inaccuracies could lead to higher or lower values. The relaxation approach was selected as this was considered to be more consistent with the Commission's specific outcome (f) of "…sustained downward pressure on prices"[15]. That is, relaxing a constraint will, in general, be more likely to lead to lower prices than tightening the same constraint.

89. It is also noted that tightening a constraint would have the effect of increasing the locational price signals from constraints. As noted below, under dynamic price caps, some participants have expressed concern that very high locational prices make hedging locational price risk more difficult. Therefore tightening the constraint could be viewed as inconsistent with the Commission's specific outcome (b) to ensure "risks (including price risks) relating to security of supply are properly and efficiently managed"[16].

Dynamic price caps

90. An alternative option, of imposing a dynamic cap on final prices, was also considered.

[14] Section 172N(2)(e) of the Act.
[15] Section 172N(2)(f) of the Act.
[16] Section 172N(2)(b) of the Act.

91. Under this approach, prices would be capped at a ratio of 'X' times the highest cleared generator offer price. Again the value 'X' would be determined and published by the Commission from time to time. This approach is similar to the first approach but eliminates the need to relax a constraint by using the 'trigger' value as a price cap.

92. The advantage of this approach, relative to the preferred constraint relaxation approach, is that it would minimise locational price differences between nodes. It would do this by capping the constraint price element of the locational price. As the constraint element of the locational price is the key driver of the locational price this approach would dampen the locational price variability.

93. Some parties consider the high variability of the locational price a barrier to developing effective risk management products such as energy hedges. Therefore this approach would enhance the Commission's specific outcome set out in section 172N(2)(b) of the Act to ensure "risks (including price risks) relating to security of supply are properly and efficiently managed".

94. However, in achieving this, it would undermine the locational price signal and hence undermine the specific outcome set out in section 172N(2)(e) of the Act that "the full costs of producing and transporting each additional unit of electricity are signaled".

Assessment of options

95. The constraint relaxation approach would better meet the specific outcome in section172N(2)(e) of the Act that "the full costs of producing and transporting each additional unit of electricity are signaled" than the dynamic price cap option. In doing so, it would maintain the high degree of locational price variability currently seen in spot prices.

96. Some parties have expressed concern that such high location price variability is undermining the ability to develop energy hedge products and hence undermining the Commission's ability to meet the specific outcome in section 172N(2)(b) of the Act to ensure "risks (including price risks) relating to security of supply are properly and efficiently managed".

97. However, the Commission considers there are other means of addressing these concerns, such as development of a transmission hedge (such as a financial transmission right (FTR)). Therefore, the Commission considers that, on balance, the constraint relaxation approach is preferred because it meets the objective of the Proposal and better achieves the Commission's specific outcomes than the dynamic price cap option.

Assessment of non-rule options

98. The Commission also considered whether the objective of the Proposal could be satisfactorily achieved by non-rule options. The Commission identified an option to implement the Proposal as a change to the service provider contracts rather than a change to the Rules. However, it considers this would not achieve the objective to a satisfactory extent as it would introduce further uncertainty into the process for resolution of such high spring washer price situations due to the lack of transparency and questions of enforceability around processes outside the Rules.

Implementation issues

99. Consideration was also given to the practical process of how to implement the proposed approach of reviewing the robustness of input data for high spring washer price situations. Key issues were how to detect high spring washer prices (triggers) and how to resolve them (constraint relief).

Triggers

100. The key implementation issues for determining the process for triggering a High Spring Washer Price Situation (HSWPS) were:

    a. Ensuring an accurate triggering of a HSWPS; and

    b. How to set the trigger value.

Trigger accuracy

101. Frequency keeping constraints can mask a true HSWPS and high instantaneous reserve (IR) prices could falsely trigger a HSWPS.

102. When a generator is providing frequency keeping, it may need to be 'constrained on' by the system operator in order to ensure that it is in a position where it can provide frequency keeping[17]. That is, it may be dispatched to a level at which its energy offer is higher than the final price. If the price of the energy offer at the level to which it is dispatched is very high, it would count as a cleared offer and might mask a HSWPS, ie the highest cleared energy offer would be artificially high, which might mean that the spring washer price is less than the HSWPS multiplied by the highest cleared energy offer set by the frequency keeping station. To avoid such masking, the HSWPS test consequently needs to explicitly exclude the effect of constrained on frequency keeping[18].

103. IR could falsely trigger a HSWPS because IR and energy are co-optimised in the dispatch and pricing process. A very high IR price could lead to a very high energy price without there being any very high price energy offers cleared. This could falsely trigger a HSWPS when the high energy price was driven by the reserve price and not by a transmission constraint. To avoid such false triggering the HSPWS test needs to explicitly exclude high nodal prices driven by reserve prices.

104. The ideal way to avoid these problems would be to determine which constraint caused a HSWPS, and only trigger a HSWPS when a constraint causing it has been identified. This would also allow very targeted constraint relaxation of constraints for a HSWPS. Unfortunately, the current version of SPD does not allow identification of the relationship between a given price and different constraints.

Setting the trigger value

105. Setting the trigger value is a trade off between ensuring it is set sufficiently high to avoid unnecessarily flattening real constraint prices, and setting it sufficiently low that high constraint prices are adequately tested.

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[17] This is because the generator may only be able to provide frequency keeping when its generation is above a certain level.

[18] Potentially, any constrained on offer could mask a HSWPS. However, frequency keeping is the only such offer likely to have a cleared energy offer of sufficiently high price to mask a HSWPS.

106. The system operator undertook some tests on three months' pricing data to determine an appropriate trigger ratio value[19]. On the basis of this testing they suggested an initial value of five, ie the ratio of the highest energy price to the highest cleared offer should be five before a HSWPS is declared.

107. The WMAG accepted this initial recommendation but noted it would need to be reviewed after some practical experience of operating the rule. To avoid the delays associated with gazetting a rule change, the WMAG suggested the trigger ratio value should not be hard coded into the Rules and should instead be able to be set from time to time by the Board. This would need to be subject to appropriate consultation to ensure widespread industry input to any change.

Constraint relief

108. Extensive discussions were held with the system operator about the best means to determine which constraint to relax for a HSWPS and by how much it should be relaxed.

109. As noted above, the current version of SPD is unable to identify which constraint led to which HSWPS and how much it contributed to each HSWPS. The system operator also questioned whether the 1% relaxation value would always be appropriate or whether some ceiling on the total relaxation amount might also be required. For example, the group branch constraint to control Auckland voltage security limits is approximately 1100MW. Relaxing this constraint by 11MW may constitute a greater relaxation than is strictly necessary to account for input data inaccuracies. These factors may make it difficult to determine, in advance, a prescriptive process for relaxing constraints that would correctly account for every conceivable situation. Such a prescriptive process may prove inadequate in practice and would probably need to be refined with experience.

110. The Commission considered whether it would be better to allow flexibility in the methodology for constraint relief by giving the system operator a degree of discretion on the constraint relaxation methodology. Specifically it considered whether the methodology should be outside the Rules and able to be changed by negotiation between the Board and the system operator.

111. The Commission decided that in practice the methodology would still need to be fairly highly prescriptive, to give participants certainty of the pricing process, and that any changes would still require a high degree of consultation with participants. Also having processes outside the Rules raised some legal concerns about how these processes could be enforced.

112. Therefore, the Commission decided the methodology should be included within the Rules and be prescriptive.

Q5 *Should the methodology used by the system operator for relaxing the constraints be incorporated within the Rules or in a separate document outside the Rules? Please provide reasons to support your view.*

113. Under this prescriptive approach, the system operator will have no increased discretion to correct high spring washer price situations which derive from incorrectly applied

[19] Refer Transpower paper "Extreme Spring Washer Investigation – Provisional Pricing Triggers" available on www.electricitycommission.govt.nz/pdfs/advisorygroups/wmag/pdfs21July2005/CIG-Provisional-Pricing-Triggers.pdf

constraints. For example, if a constraint was incorrectly applied in the pricing process, and that constraint led to a high spring washer price situation, a provisional price situation would be declared. However, the system operator's ability to correct the error would be limited to relaxing the incorrectly applied constraint by the relaxation factor rather than having the ability to correct the constraint. The proposed rules would, however, allow greater time and opportunity to deal with these issues by creating a provisional price situation whenever such high spring washer prices occur.

114. The Commission is interested in the industry's opinion on whether the system operator's discretion should be extended to allow it to correct modelling errors.

Q6 *Do submitters support the prescriptive approach to drafting of the relaxation methodology or would they prefer greater discretion for the system operator to remove incorrectly applied constraints? Please provide reasons to support your view.*

Overview of pricing methodology

115. The Commission is aware that the pricing methodology is already fairly complicated and this proposed rule change would further complicate the process. Previously this has been addressed by including an overview diagram of the pricing process in schedule G3 of the Rules.

116. However, schedule G3 has become out of step with some pricing rule changes and is for information only in the Rules.

117. As part of this rule change the Commission has updated schedule G3, including this change (Appendix 7). Please note that as the changes are quite extensive schedule G3 is not shown in track changes.

118. This raises the issue of whether schedule G3 should be kept in the Rules or provided separately as an information only resource (summarising the pricing process) directly on the Commission's website.

Q7 *Should the pricing process overview diagram, currently in schedule G3 of the Rules, be retained as part of the Rules or be deleted and be provided as an information only resource directly on the Commission's website? Please state the reasons for your view.*

Proposed rule amendments

119. As set out above, the Proposal consists of an integrated package of rule amendments required to provide certainty that high spring washer prices in final prices reflect genuine transmission security constraints. The proposed rule amendments are detailed in Appendix 2, while an overview of the proposed rule changes is provided below.

Detect high spring washer prices

120. A definition of the term 'high spring washer price situation' needs to be added to the Rules. As recommended by the WMAG, a HSWPS would occur whenever the maximum energy price at any node is more than the HSWPS multiplied by the maximum cleared generator offer price. It would be the Pricing Manager's responsibility to detect these situations.

121. The value of the HSWPS ratio would be set from time to time by the Commission, subject to industry consultation.

Delay publication of final prices

122. The detection of the HSWPS should delay publication of final prices by creating a 'provisional price situation' and provisional prices would be published in the interim.

Resolution of high spring washer prices

123. It is proposed that high spring washer prices are resolved by relaxing the relevant transmission security constraint by 1MW or 1% of the constraint value, whichever is the greater. This would be the responsibility of the system operator. It is important to note: relaxing the constraint will always reduce total prices[20] but may increase some local prices[21]; the price reduction may not always be significant; and some prices may stay above the trigger ratio value. It will, however, ensure that the resulting price is robust and not sensitive to minor inaccuracies in the input data.

Publication of final prices

124. The pricing manager would publish final prices based on the inputs revised by the system operator, as above.

Process for amending rules

125. The Minister of Energy (Minister) may make a rule for all or any of the purposes for which an electricity governance regulation may be made[22]. A rule is made by publishing a notice in the *Gazette*[23].

126. If the Minister makes, or the Commission recommends, a rule for a purpose for which an electricity governance regulation may be made, the Minister and the Commission must comply with the same conditions and process that would apply under section 172D(3)[24], section 172E, or section 172F of the Act if they were making recommendations on that electricity governance regulation, and those sections apply (with all necessary modifications) accordingly.

127. Sections 172X and 172Z of the Act also apply[25]. The Commission must, in formulating recommendations, give effect to its principal objectives and specific outcomes and the Government Policy Statement on Electricity Governance (GPS) objectives and outcomes[26]. The Minister must have regard to a recommendation by the Commission in exercising any of his functions or powers in relation to the Rules.[27]

128. Under section 172E(2)(b) of the Act, before making a recommendation, the Commission must:

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[20] That is, relaxing a constraint will always maintain or reduce the total cost to consumers.
[21] Relaxing one constraint may cause a high price to arise elsewhere in some (rare) circumstances.
[22] Section 172H of the Act.
[23] Section 172I of the Act.
[24] Section 172D(3) of the Act provides that the Commission and the Minister must ensure, before making a recommendation for any rules under section 172D(1)(2) of the Act, that those rules do not provide for undue discrimination between electricity generators.
[25] Section 172E(2)(a) of the Act.
[26] Section 172X of the Act.
[27] Section 172Z of the Act.

a. undertake an assessment under section 172F of the Act;

b. consult with persons that the Commission thinks are representative of the interests of persons likely to be substantially affected by the proposed rules;

c. give those persons the opportunity to make submissions; and

d. consider those submissions.

129. Under section 172F(1) of the Act, before making a recommendation, the Commission must:

a. seek to identify all reasonably practicable options for achieving the objective of the rule;

b. assess those options by considering the benefits and costs of each option, the extent to which the objective would be promoted or achieved by each option, and any other matters that the Commission considers relevant;

c. ensure that the objective of the rule is unlikely to be satisfactorily achieved by any reasonably practicable means other than the making of the rule (for example, by education, information or voluntary compliance); and

d. prepare a statement of proposal for the purpose of consultation under section 172E(2)(b)(ii) of the Act[28].

Statement of proposal and assessment

130. The Commission has prepared a statement of proposal, including the assessment, as required under section 172F of the Act. The statement of proposal is set out in Appendix 1 of this paper.

Consideration against the relevant objectives

131. As discussed above, in formulating recommendations for rules, the Commission must give effect to its principal objectives and specific outcomes and its GPS objectives and outcomes.

132. The ways in which the Proposal gives effect to the relevant objectives and outcomes are set out in Appendix 3.

Conclusion

133. The Commission concludes that this Proposal will further its relevant principal objectives and outcomes and the GPS objectives and outcomes.

134. The Commission considers that the Proposal is supported on the basis of the assessment of the benefits and costs.

[28] Section 172F(2) provides that the statement of proposal must contain a detailed statement of the proposal, a statement of the reasons for the proposal and an assessment of the reasonably practicable options, including the proposal, and other information that the Commission considers relevant. Under section 172E(2)(b)(ii), the Commission must consult with persons that it thinks are representative of the interests of persons likely to be substantially affected by the proposed rule.

135. The Commission also considers the proposed amendments to the Rules will achieve the objectives of the Proposal to a greater extent than any practicable alternative option.

Appendix 1: Statement of proposal

136. Sections 172E and 172F of the Electricity Act 1992 (Act) set out the requirements on the Electricity Commission (Commission) regarding consultation on, and assessment of, a rule before a recommendation can be made to the Minister of Energy (Minister)[29].

137. The Proposal consists of an integrated package of recommended rule amendments required to clarify pricing in the presence of high constraint prices under the Electricity Governance Rules 2003 (Rules). Accordingly, this statement of proposal considers all of these related rule changes as one proposal (Proposal).

138. As the Proposal constitutes rule amendments, the process set out in the Act must be followed.

139. This appendix is a statement of proposal as required by section 172F(2) of the Act, for the purposes of consultation under section 172E(2)(b)(ii) of the Act. As such, it is required to set out a detailed statement of the Proposal, a statement of the reasons for it, provide an assessment of the reasonably practicable options, and any other information that the Commission considers relevant.

The Proposal

140. The objective of the Proposal is to enhance participant confidence in final prices by ensuring high spring washer prices reflected in final prices are not sensitive to minor inaccuracies in input data.

141. It is proposed to achieve this by providing specific rules on how final prices are to be determined in the presence of high spring washer price effects.

142. The Proposal is to amend the Rules as follows:

Define high spring washer price situations and transmission security constraints

143. It is proposed that prices would be reviewed whenever a 'high spring washer price situation' arises. It is therefore necessary to define a 'high spring washer price situation' and when it will exist, thus triggering the price review process.

144. This requires new definitions to be added to part A for a 'high spring washer price situation', a 'transmission security constraint' a 'constrained on offer', and a 'high spring washer price situation trigger ratio'.

Detect high spring washer price situations

145. The 'high spring washer price situation' would only occur when there is a binding 'transmission security constraint' and the highest price is greater than the highest

[29] Section 172H(3) of the Act provides that if the Minister makes, or the Commission recommends, a rule for a purpose for which an electricity governance regulation may be made, the Minister and the Commission must comply with the same conditions and process that would apply under section 172D(3), section 172E, or section 172F if they were making recommendations on that electricity governance regulation, and those sections apply (with all necessary modifications) accordingly.

cleared offer (that is not 'constrained on'[30]) by at least the 'high spring washer price situation trigger ratio'.

146. As discussed in the analysis section above, the above definitions ensure minimal risk of falsely triggering the price review process and minimal risk of missing a genuine high spring washer price.

147. It is noted that no attempt will be made to detect a high spring washer price situation until all other pricing issues, such as infeasibilities etc, are resolved.

148. This is because other issues such as infeasible prices, missing meter data etc can mask high spring washer prices.

Publish provisional prices

149. If a 'high spring washer price situation' is detected it will be treated the same as any other 'provisional price situation' and provisional prices will be published while the system operator resolves the provisional price situation.

Review and relax constraints

150. Once a 'high spring washer price situation' is detected, by the pricing manager, the system operator would review all transmission security constraints, identify the one with the highest constraint price and relax that constraint by the greater of 1MW or 1% of the constraint value.

151. It is noted that only one constraint will be relaxed, unless two constraints exist with identical constraint prices (eg for parallel lines), and the constraint will only be relaxed once.

152. It is also noted that this relaxation may not completely resolve the high prices, and possibly may not change the prices at all.

153. This limit to the relaxation methodology is to minimise any possible undermining of the integrity of the pricing process associated with relaxing constraints.

Publish final prices based on revised constraint data

154. The system operator will provide the revised pricing data, with the constraint relaxed as above, to the pricing manager. The pricing manager will publish final prices based on this data.

155. Appendix 2 contains the proposed rules required to implement this Proposal.

Statement of the reasons for the Proposal

156. The proposed rule amendments aim to enhance participants' confidence in final prices by ensuring high spring washer prices in final prices are not sensitive to minor inaccuracies in the input data.

[30] This is to exclude offers that are constrained on by the system operator for frequency keeping and therefore do not directly affect price.

Assessment of the reasonably practicable options

157. Section 172F(1) of the Act requires the Commission to seek to identify all reasonably practicable options for achieving the objective of the Proposal.

158. The Commission has identified two reasonably practicable options for achieving the objective of the Proposal. It has also identified several means of achieving the objective without regulation but considers these are not reasonably practical.

Option 1 – Constraint relaxation

159. Under this option the pricing manager would detect high spring washer prices prior to final prices being published. The system operator would then relax the relevant constraint by the greater of either 1MW or 1% of the constraint value to ensure the final prices are robust, ie not sensitive to minor inaccuracies in input data. Final prices would be published based on these relaxed constraint values.

Option 2 – Dynamic price caps

160. Under this option the pricing manager would apply dynamic price caps to all prices, limited to five times the highest cleared generator offer price.

Evaluation

161. Both option 1 (constraint relaxation) and option 2 (dynamic price caps) would achieve the objective of the Proposal (to increase participants' confidence that final prices accurately reflect physical conditions).

Option 1 – Constraint relaxation

162. The advantage of this approach is that it would ensure the locational element of final prices reflects the physical reality of the situation and hence ensure prices better meet the Commission's specific outcome in section 172N(2)(e) of the Act that "the full costs of producing and transporting each additional unit of electricity are signaled".

163. The disadvantage of this approach is that it would continue the current price arrangements whereby the volatility of the locational element of final prices can by quite high. Some parties see this as a barrier to the development of energy hedging arrangements and hence a barrier to the Commission's achievement of specific outcome set out in section 172N(2)(b) of the Act that "risks (including price risks) relating to security of supply are properly and efficiently managed."

164. However, the Commission considers that such concerns are better addressed through other mechanisms, such as FTRs.

Option 2 – Dynamic price caps

165. The advantage of this approach is it would reduce the volatility of the locational element of final prices and make it easier to develop energy hedges. However, as noted above, the Commission considers there are other ways of addressing these concerns.

166. The disadvantages of this approach are:

    a. It would be difficult to determine and reach agreement on an appropriate value for the price cap;

    b. It would be inconsistent with the Commission's specific outcome in section 172N(2)(e) of the Act of ensuring "the full costs of producing and transporting each additional unit of electricity are signalled", ie by capping genuine spring washer prices it would fail to signal the true marginal cost of the constraint; and

    c. It may increase uncertainty over future prices as participants may have concern that the Commission, or Government, may intervene to adjust the cap.

167. On the basis of the above evaluation, the Commission concludes that option 1 (constraint relaxation) is more consistent with the Commission's specific outcomes.

Q8 *Do submitters agree that option 1 – constraint relaxation, is more consistent with the Commission's specific outcomes than option 2 – dynamic price caps?*

Q9 *If not, please explain the rationale for your views.*

Assessment of non-regulatory options

168. Section 172F(1)(c) of the Act requires the Commission to also ensure the objective of the Proposal is unlikely to be satisfactorily achieved by any reasonably practical means other than the Proposal.

169. The Commission considered an alternative (non-rule) option for achieving the objective of the Proposal would be to require the system operator to review any excessively high prices, as per the Proposal, but as part of their service provider contract rather than via the Rules.

170. The advantage of this approach is that it would be less time consuming to process as the consultation requirements for changes to the service provider contracts are simpler than for changes to the Rules.

171. The disadvantage is that there would be less transparency around the process for resolving high spring washer prices if this process were buried in a service provider contract rather than set out in the Rules. Market participants would, therefore, have less confidence that such processes were consistent and enforceable. They would also have a lower level of understanding of likely future outcomes, due to lack of transparency, and this could introduce regulatory uncertainty into any future investment decision process based on price expectations.

172. Because this non-rule approach would introduce further uncertainty in the final pricing process, as described above, the Commission considers it would not achieve the objective of the Proposal to a satisfactory extent and did not pursue it further.

Assessment of benefits and costs

173. Section 172F(1) of the Act requires the Commission to assess the costs and benefits of each reasonably practicable option, including the Proposal. Both option 1 (constraint relaxation) and option 2 (dynamic price caps) are likely to have similar benefits and it is not practically possible to distinguish the costs and benefits of these options. This cost benefit analysis therefore assesses the overall costs and benefits of a generic rule

change relative to the status quo. The choice of which rule change option is best is done above on the basis of which best achieves the Commission's specific outcomes.

Summary of costs and benefits

Costs

174. The system operator and pricing manager have advised that the implementation and operating costs of the proposed change would be approximately $30,000 as a one off cost, with no additional operating costs.

Benefits

175. The purpose of including a locational element in the locational marginal price is to:
    a. Allow market based generator locational investment decisions;
    b. Allow market based purchaser locational investment decisions;
    c. Encourage appropriate real-time purchaser consumption decisions; and
    d. Allow efficient real-time dispatch of available generation resources.

176. To the extent that such locational prices are attributable to input data inaccuracies, the above objectives of the locational marginal price would be undermined. It is difficult to assess the extent to which very high spring washer prices might undermine these objectives due to input data inaccuracies, and what the costs of such 'inaccuracies' might be.

177. One way of approaching this issue would be to first estimate the extent of the change in purchaser payments that might otherwise result from such 'erroneous' prices and use this to estimate the possible benefits of eliminating such pricing 'inaccuracies'.

178. High spring washer prices result in large payments by purchasers. Eliminating the likely inaccuracies in such high spring washer prices reduces costs to purchasers.

179. One way of estimating the change in costs to purchasers is to measure the change in loss and constraint rentals. Loss and constraint rentals represent the excess purchasers pay over the amount generators receive in the market. Appendix 6 provides a calculation of the change in loss and constraint rentals under the proposed rule change, based on a sample of five high spring washer prices in the six months from March to August 2004. It then extrapolates this six month sample to one year and provides a ten year net present value (NPV) of the resulting change in loss and constraint rentals. This yields a net reduction of approximately $24 million in loss and constraint rentals over a ten year period. This represents the reduction in costs to purchasers if the Proposal was to proceed.

180. The actual efficiency gains in generator locational investment decisions, purchaser locational investment decisions, purchaser real-time consumption decisions, and dispatch efficiency will be proportional to, but much less than, this change in purchaser payments. It is difficult to accurately estimate what such gains might be, but if a conservative approach is taken, estimating relatively low gains, and this yields a net positive result, then the cost benefit analysis is robust. For the sake of this analysis it is assumed that the gains in each of the four areas are only 1% of the total value of the change in the loss and constraint rental. That is, the total efficiency gains are 4% of the total change in loss and constraint rentals.

181. Therefore, the total benefits of the proposed rule change, over a ten year period, are approximately 4% of $23 million = $970,000.

182. As a sanity check on the above calculation of benefits, an alternative way of viewing the rule change proposal is that it reduces the risk of increased regulation and control within the wholesale market. Very high purchaser prices can lead to increased political pressure for regulatory intervention in the market, which would undermine the benefits of the market outlined in paragraph 175 above.

183. In its submission on the Commission's consultation paper on transmission alternatives, Transpower suggested the value of the market process was around $7 billion (refer section 3.3.8 of Castalia's supporting document for Transpower's transmission alternatives submission on: http://www.electricitycommission.govt.nz/pdfs/submissions/pdfstransmission/options-trans-alt/Transpower2.pdf).

184. If participants lack confidence in the pricing process there is an increased probability that the market could lose credibility and potentially collapse. This could put at risk the $7 billion benefit of the market. Even a very small reduction in the risk of market collapse would result in a very large benefit. The assessed benefit of $970,000 represents a 0.01% change in the level of risk of market collapse. Therefore, the above benefits seem reasonable.

185. This suggests the proposed change has an overall net positive benefit of $970,000 - $30,000 = $940,000 relative to the status quo. Details of the cost benefit analysis are included in Appendix 6.

Q10 *Do submitters agree with the assumptions used in the above cost benefit analysis? If not, what alternative assumptions or analysis approach would you propose?*

Appendix 2: Recommended rule amendments

186. The proposed amendments to the Rules are marked up (insertions are shown as underlined and deletions are struck out).

Part A Interpretation

bound, in relation to a **transmission security constraint**, means that the flow of **electricity** through one or more transmission lines or transformers is equal to or greater than the **transmission security constraint** applied to those transmission lines or transformers, and **bind** has a corresponding meaning

constraint price, in relation to a **transmission security constraint**, means the amount in dollars and cents per **MW** by which the objective function described in rule 2 of schedule G6 of part G is decreased by relaxing the **transmission security constraint** by a minute amount

high spring washer price relaxation factor means, in relation to a **high spring washer price situation** in a **trading period**, the greater of 1**MW** or 1% of the relevant **transmission security constraint** that has **bound** in the **trading period**

high spring washer price situation means a situation in a **trading period** where:

(a) one or more **transmission security constraints bind**; and

(b) the **software** used by the **pricing manager** to calculate **provisional prices** and **final prices** calculates a price for **electricity** at any **grid injection point** or **grid exit point** that is equal to or greater than the product of the **high spring washer price trigger ratio** times the highest **unconstrained cleared offer price** in that **trading period**

high spring washer price situation methodology means the methodology described in rule 2B.2 of section V of part G

high spring washer price trigger ratio means the ratio set by the **Board** from time to time in accordance with rule 2A of section V of part G

~~"~~**provisional price situation**~~"~~ means ~~any circumstance where there is~~ a **metering situation**, a **SCADA situation**, ~~or~~ an **infeasibility situation, or a high spring washer price situation**;

transmission security constraint means a flow limit set in accordance with paragraphs (d) or (f) of rule 4.2 of schedule G6 of part G, excluding a flow limit set in relation to the **HVDC link**

unconstrained cleared offer price means the highest amount in dollars and cents per **MWh** specified for a **grid injection point** or a **grid exit point** in an **offer** that is provided to the **pricing manager** in accordance with rule 3.8 of section III of part G that is less than or equal to the price for **electricity** at that **grid injection point** or **grid exit point** calculated by the **software** used by the **pricing manager** to calculate **provisional prices** and **final prices**

Part G Trading arrangements

Section V Pricing

1. Contents of section V

Section V provides for the processes by which the **pricing manager** receives data and produces **provisional prices** and **final prices**.

1.1 Diagram of the pricing process in schedule G3

A diagram in schedule G3 shows how the pricing process operates on **business days**.

1.2 Rules take precedence over the diagram

If there is any conflict between the process as shown in the diagram and the process as set out in the **rules**, the process set out in the **rules** prevails.

2. Purpose of the pricing process

The purpose of the pricing process is to achieve certainty as to **final prices** and **final reserve prices** for each **trading period**. As part of the process:

2.1A Steps to be taken during provisional price situations

The **system operator,** the **pricing manager**, a **grid owner,** or a **generator** must take certain steps if a **provisional price situation** exists; and

2.1 Production of final prices for settlement

The **pricing manager** must~~will~~ produce **final prices** and send them to the **clearing manager**, who will then use them in the clearing and settlement processes; and

2.2 Production of final reserve prices

The **pricing manager** must~~will~~ produce **final reserve prices**.

2A. Trigger ratio for high spring washer price situation

2A.1 Board must set and publicise trigger ratio

2A.1.1 The **Board** must set and **publicise** a **high spring washer price trigger ratio**.

2A.1.2 The **Board** may from time to time revoke a **high spring washer price trigger ratio** and substitute a new ratio. These **rules** (including

rule 2A.2.1) apply to a substituted ratio as if the substituted ratio were the original ratio.

2A.2 Process for setting high spring washer price trigger ratio

2A.2.1 The **Board** must not set or **publicise** a **high spring washer price trigger ratio** unless it has consulted with **participants** the **Board** thinks are likely to be substantially affected by the ratio.

2A.2.2 A **high spring washer price trigger ratio** is not invalid only because the **Board** undertook consultation on the ratio before this rule came into force.

2B. Methodology to resolve high spring washer price situation

2B.1 When this rule applies

Subject to rule 2B.3, this rule applies if the **pricing manager**, in relation to a **trading period**,—

2B.1.1 gives notice in accordance with rules 3.6, 3.18.4, or 3.21.3 that a **high spring washer price situation** exists; or

2B.1.2 publishes a **provisional price** or a **provisional reserve price** in accordance with rules 3.11 or 3.12 because the revised data required by rule 3.8 and the notice required by rule 3.9 in relation to a **high spring washer price situation** have not been given; or

2B.1.3 publishes a **provisional price** or a **provisional reserve price** in accordance with rule 3.15 because the revised data provided in accordance with rule 3.8 and the notice given in accordance with rule 3.9 have given rise to a **high spring washer price situation.**

2B.2 System operator to follow high spring washer price situation methodology

If this rule applies, the **system operator** must:

2B.2.1 first, identify each **transmission security constraint** that has **bound** in the relevant **trading period; and**

2B2.2 second, identify the **constraint price** associated with each **transmission security constraint** identified in accordance with rule 2B.3.1; and

2B2.3 third, apply the **high spring washer relaxation factor** to the maximum flow limit of the **transmission security constraint** with the highest associated **constraint price**, or, if one or more **transmission security constraints** have the equal highest associated **constraint price**, to the maximum flow limit of each of those **transmission security constraints**.

2B.3 Limits on use of high spring washer price situation methodology

This rule does not apply in relation to a **trading period** if rule 2B.2 has already been complied with in relation to the relevant **trading period**.

3. Rules governing the preparation of provisional and final prices

3.1 Methodology used to prepare provisional and final prices

To calculate **provisional prices, provisional reserve prices**, **final prices** and **final reserve prices** the **pricing manager** mustwill use:

3.1.1 Input information

The **input information** set out in rule 3.3; and

3.1.2 Methodology

The methodology set out in schedule G6.

3.2 Generators to give pricing manager half-hour metering information

3.2.1 Generators to provide half-hour metering information

Each **generator** mustwill give the **pricing manager**, and each **embedded generator** mustwill give to the **pricing manager** and the **grid owner** connected to the **local network** in which the **embedded generator** is located, **half-hour metering information** in accordance with rule 3.2.3 in relation to **generating plant** that is subject to a **dispatch instruction**:

3.2.1.1 Electricity injected directly into a local network

That injects **electricity** directly into a **local network**; or

3.2.1.2 Electricity injected without grid exit point or grid injection point

Where the meter configuration is such that the **electricity** flows into a **local network** without first passing through a **grid injection point** or **grid exit point metering installation**.

For the avoidance of doubt this excludes any **unoffered generation** or **electricity** supplied from an **intermittent generating station**.

3.2.2 Unoffered and intermittent generation to provide metering information

Each **generator** must~~will~~ give the **pricing manager** and the relevant **grid owner** **half-hour metering information** for:

3.2.2.1 Unoffered generation

Any **unoffered generation** from a **generating station** with a **point of connection** to the **grid**; and

3.2.2.2 Intermittent generation

Any **electricity** supplied from an **intermittent generating station** with a **point of connection** to the **grid**.

If~~Where~~ such **half-hour metering information** is not available the **generator** must~~will~~ give the **pricing manager** and the relevant **grid owner** a reasonable estimate of such data.

3.2.3 Half-hour metering information to be adjusted for losses

Each **generator** must~~will~~ provide the information required by ~~in~~ rules 3.2.1 and 3.2.2:

3.2.3.1 Adjusted for losses

Adjusted for losses (if any) relative to the **grid injection point** or, for **embedded generators** the **grid exit point**, at which it offered the **electricity**;

3.2.3.2 As stipulated by the pricing manager

In the manner and form that the **pricing manager** stipulates; and

3.2.3.3 By 0500 hours

By 0500 hours on a **trading day** for each **trading period** of the previous **trading day**.

3.2.4 Half-hour metering information is part of input information

The adjusted embedded **half-hour metering information** forms part of the formula contained in rule 3.3.2.1.

3.2.5 Generators to notify provision of half–hour metering information

IfWhere any **generator** provides **half-hourly metering information** to the **pricing manager** or a **grid owner** under this rule 3.2, the **generator** it will mustalso, by 0730 hours oneof that day, **publish** notice that it has given the **pricing manager** or relevant **grid owner half-hourly metering information**.

3.3 The pricing manager to use certain input information

The **pricing manager** mustwill use the following **input information**:

3.3.1 Existing generation configuration

3.3.1.1 Instantaneous MW injection data

Data specifying the instantaneous **MW** injection at the **grid injection point** at the beginning of each **trading period** for all items of **generating plant** or **generating units** which were the subject of **offers** for that **trading period**; or

3.3.1.2 Estimate

If no such information is available, a reasonable estimate of such data.

Each **Ggrid owners** mustwill give thethis information required by this rule to the **pricing manager** by 0730 hours on a **trading day** in relation to each such **generating plant** or **generating unit** for each **trading period** of the previous **trading day**.

3.3.2 Actual demand over the trading period

3.3.2.1 Demand half-hour metering information

The demand **half-hour metering information** described as L_{MA} below mustis to be calculated as follows:

$L_{MA} = G_{EA} + L_{MX}$ (for a **grid exit point**)

Or

$L_{MA} = G_{EA} - L_{MI}$ (for a **grid injection point**)

Or

$L_{MA} = L_{MX} - UIG_{EA}$ (for an **intermittent generating station** with a **point of connection** to the **grid** and/or **unoffered generation** from a **generating station** with a **point of connection** to the **grid**)

where:

L_{MA} means the adjusted quantity of **electricity** measured in **MWh** by a **metering installation** at a **grid exit point** or **grid injection point**;

L_{MX} means the unadjusted **half-hour metering information** for the quantity of **electricity** measured in **MWh** at a **grid exit point**;

L_{MI} means the unadjusted **half-hour metering information** for the quantity of **electricity** measured in **MWh** at a **grid injection point**;

G_{EA} means the adjusted **half-hour metering information** given to the **pricing manager** pursuant to rule 3.2; and

UIG_{EA} means the information given to the **pricing manager** pursuant to rule 3.2.2; or

3.3.2.2 Estimate

~~Where~~If any of the **half-hour metering information** is not available, an **initial estimate** for each **grid exit point** or **grid injection point**.

Each g~~G~~**rid owner** must~~will~~ give the~~is~~ information required by this rule to the **pricing manager** by 0730 hours on a **trading day** for each **trading period** of the previous **trading day**. The information must be provided in a form that must be specified by the **pricing manager**.

3.3.3 Expected supply based on offers

The final **offers** for each **trading period** submitted by the **generators** and provided ~~as given~~to the **pricing manager** by the **system operator** in accordance with~~pursuant to~~ rule 3.8 of section III. The **pricing manager** must~~will~~ remove all **offers** from **intermittent generators** from this information before using it in the pricing process; and

3.3.4 Reserve offers

The final **reserve offers** for each such **trading period** as given by **ancillary service agents** in accordance withpursuant to rule 6 of section II; and

3.3.5 System operator information

The final information for each **trading period** that the **system operator** notifies in accordance withpursuant to rule 3.8 of section III.

3.4 Pricing manager to publish final prices unless a provisional price situation notified

If on a **trading day** no notice has been given of a **provisional price situation** in accordance withunder rules 3.5, or 3.6, or 3.7, the **pricing manager** mustwill **publish final prices** and **final reserve prices** by 1200 hours on that day for the previous **trading day**.

3.5 Grid owners to notify SCADA situation

3.5.1 Grid owners notify pricing manager

When any If a **grid owner** gives any **input information** in accordance with under rule 3.3 to the **pricing manager**, the **grid owner** **it** mustwill also:

3.5.1.1 Publish notice

Publish notice that it has given the **pricing manager input information**; and

3.5.1.2 Specify whether a SCADA situation exists

Specify in the notice whether the **input information** yields a **SCADA situation**, and if so each **trading period** affected; and

3.5.1.3 Specify grid exit points and grid injection points

Give details in theevery such notice of the relevant **grid exit points** and **grid injection points** for which the **SCADA situation** exists.

3.5.2 Notice to be given by 0730

A **gGrid owners** mustwill give the notice required byunder rule 3.5.1.1 by 0730 hours on the day on which it gives the relevant **input information**.

3.5.3 Grid owner may give further notices

Despite ~~Notwithstanding~~ rule 3.5.2, the **grid owner** may **publish** further notices advising that the **grid owner** has found that a **SCADA situation** does exist and which **trading periods** are affected by it.

3.5.4 Grid Owner must publish ~~No further~~ notices ~~after~~ by 0900

A g~~G~~rid owner~~s~~ must~~will~~ **publish** every notice required by ~~under~~rule 3.5.3 by no later than 0900 hours on the same day that it gave notice under rule 3.5.1.1.

3.6 Pricing manager to give notice~~notification~~ of an infeasibility situation, a metering situation, or a high spring washer price situation

3.6.1 Pricing manager to give~~s notice to grid owners and generators~~

Subject to rule 3.7A, ~~if~~ the **pricing manager** receives **input information** ~~from any **grid owner** under rule 3.3~~ that yields an **infeasibility situation**, or a **metering situation**, or a **high spring washer price situation**, the **pricing manager** must, not later than 0900 hours on the day that the **pricing manager** receives the **input information**~~will~~:

3.6.1.1 Publish notice

Publish notice of~~that~~ any **infeasibility situation**, or ~~a~~ **metering situation**, or **high spring washer price situation** that exists; and

3.6.1.2 Specify the affected trading periods

Specify in ~~every such~~the notice each **trading period** affected by an **infeasibility situation**, or **metering situation**, or **high spring washer price situation**; and~~,~~

3.6.1.3 Specify relevant transmission security constraints

In relation to each **trading period** affected by a **high spring washer price situation**, specify in the notice each **transmission security constraint** that has **bound** in the relevant **trading period** or **trading periods**.

~~by 0900 hours on the day that the **pricing manager** receives the relevant **input information**.~~

3.7 Grid owner to give notice that estimated data given

If a~~ny~~ **grid owner** gives the **pricing manager** estimated **input information** in accordance with~~under~~ rule 3.3.1.2 or rule 3.3.2.2, the **grid owner** must, ~~will~~ by 0730 hours on the day the relevant **input information** is required by rule 3.3:

3.7.1 Publish notice

Publish notice of any~~that the~~ **input information** that is estimated; and

3.7.2 Specify whether metering or SCADA information

Specify in the~~every such~~ notice whether the estimated information relates to **SCADA** or **half-hour metering information**; and

3.7.3 Specify grid exit points and grid injection points

Give details in the~~every such~~ notice of the ~~relevant~~ **grid exit points** and **grid injection points** to which the estimated information relates.

3.7A Prohibition on notice of high spring washer price situation if infeasibility situation, metering situation, or SCADA situation exists

The **pricing manager** must not give notice of a **high spring washer price situation** in accordance with rule 3.6 in relation to a **trading period** if an **infeasibility situation**, or a **metering situation**, or a **SCADA situation** exists in that **trading period** and it has not been resolved.

3.8 Requirements if ~~Grid owners to exercise reasonable endeavours to rectify~~ provisional price situation exists

3.8.1 SCADA situation, metering situation, or infeasibility situation

If notice is given:

3.8.1.1 SCADA situation

By a~~ny~~ **grid owner** to the **pricing manager** of a **SCADA situation** in accordance with~~under~~ rule 3.5; or

3.8.1.2 Metering situation

By the **pricing manager** of a **metering situation** in accordance with~~under~~ rule 3.6~~5~~; or

3.8.1.3 Infeasibility situation

By the **pricing manager** of an **infeasibility situation** in accordance withunder rule 3.6,

the relevant **grid owners,** and, in the case of an **infeasibility situation**, the **system operator** mustwill exercise reasonable endeavours to resolvecorrect the **provisional price situation** and to provide revised data to the **pricing manager**.

3.8.2 High spring washer price situation

If notice is given of a **high spring washer price situation** in accordance with rule 3.6, the **system operator** must apply the **high spring washer price relaxation factor** in accordance with the **high spring washer price situation methodology** and exercise reasonable endeavours to provide revised data to the **pricing manager**.

3.8.3 Provision of revised data

The revised data required by rules 3.8.1 and 3.8.2 must be provided to the **pricing manager**:

3.8.43.8.3.1 On a business day

If the **provisional price situation** arose on a **business day**, by 1000 hours on that day; and

3.8.53.8.3.2 On a day other than a business day

If the **provisional price situation** arose on a day other than a **business day**, by 1200 hours on the second **business day** after the **provisional price situation** arose.

3.8.4 Failure by generator to supply half-hourly metering information

If**Where** any **generator** has failsed to supply **half-hourly metering information** to the **pricing manager** or to a **grid owner** in accordance with under rule 3.2, and the **pricing manager** has notified a **metering situation** under in accordance with rule 3.6, then theat **generator** must use reasonable endeavours to assist the **grid owner** to resolverectify the **provisional price situation**.

3.9 Revised data to be accompanied by notice

If any **grid owner**, or a **generator**, or the **system operator** gives revised data to the **pricing manager** in accordance with pursuant to rule 3.8, by the time provided for in that

~~rule,~~ the **grid owner** ~~will~~, or **generator**, or **system operator** (as the case may be) must, by the time prescribed by that rule for giving revised data:

3.9.1 Notify pricing manager, generators and purchasers

Publish notice that revised data has been given; and

3.9.2 Specify revisions

Specify in the ~~every such~~ notice the revisions that have been made; and

3.9.3 State whether SCADA situation still exists

In the case of revised data given in relation to a **SCADA situation**, ~~S~~state in the ~~every such~~ notice whether a **SCADA situation** continues to exist; and~~.~~

3.9.4 State that the high spring washer price relaxation factor has been applied

In the case of revised data given in relation to a **high spring washer price situation**, if the **high spring washer price situation relaxation factor** has been applied, state in the notice that the factor has been applied.

3.10 Failure to give revised data and notice not a~~in~~ breach

If ~~any~~ a **grid owner,** or a **generator,** or the **system operator** fails to give ~~the~~ revised data ~~and notice~~ in accordance with~~pursuant to~~ rule~~s~~ 3.8 and notice in accordance with rule 3.9 by the time prescribed by~~required in~~ those rules, the failure will not constitute a breach of those rules if~~so long as~~ the **grid owner**, or **generator**, or **system operator** (as the case may be) has:

3.10.1 Endeavoured to remedy provisional price situation other than high spring washer price situation

In the case of a **provisional price situation** other than a **high spring washer price situation**, ~~E~~exercised reasonable endeavours to remedy the circumstance giving rise to the **provisional price situation**; and

3.10.1A Applied the high spring washer price relaxation factor

In the case of a **high spring washer price situation**, applied the **high spring washer price relaxation factor** in accordance with the **high spring washer price situation methodology**; and

3.10.2 Endeavoured to notify

~~If any notices were required,e~~Exercised reasonable endeavours to provide the notice required by rule 3.9~~them~~.

3.11 Pricing manager to publish a provisional price and provisional reserve price if revised data and notice not given in relation to ~~the grid owner is unable to rectify~~ provisional price situation arising on a business day

If notice of a **provisional price situation** is given on a **business day**, and ~~the~~ a **grid owner**, or a **generator**, or the **system operator** does not give ~~the~~ revised data in accordance with ~~and notices required by~~ rule~~s~~ 3.8 and notice in accordance with rule 3.9 by~~within~~ the time prescribed by those rules, the **pricing manager** must~~will~~:

3.11.1 Publish notice

By 1200 hours on that day **publish** notice of the **provisional price situation** and each **trading period** affected; and

3.11.2 Publish a provisional price and provisional reserve price

By 1200 hours on that day **publish** a **provisional price** and a **provisional reserve price**; and

3.11.3 Inform the Board

By 0900 hours on the following day inform the **Board** of the **provisional price situation** in the daily report submitted in accordance with~~pursuant to~~ rule 7.1.

3.12 Pricing manager to publish a provisional price and provisional reserve price if revised data and notice not given in relation to provisional price situation arising ~~arises~~ on a day other than a business day

If notice of a **provisional price situation** is given ~~pursuant to rules 3.5 or 3.6~~ on a **day** other than a **business day,** and ~~the~~ a **grid owner**, or a **generator**, or the **system operator** does~~has~~ not give~~n~~ revised data in accordance with ~~and notices pursuant to~~ rule~~s~~ 3.8 and notice in accordance with rule 3.9, ~~within the time prescribed by those rules~~ the **pricing manager** must~~will~~:

3.12.1 Publish notice~~Notify generators and purchasers~~

By 1000 hours on the~~that~~ day that the notice of a **provisional price situation** was given, **publish** notice of the **provisional price situation** and each **trading period** affected; and

3.12.2 Publish a provisional price and provisional reserve price

By 1000 hours on that day **publish** a **provisional price** and a **provisional reserve price**; and

3.12.3 Inform the Board

By 0900 hours on the following day inform the **Board** of the **provisional price situation** in the daily report submitted ~~pursuant to~~ in accordance with rule 7.1.

3.13 Data to be used by the pricing manager to determine a provisional price and provisional reserve price

The **pricing manager** must~~will~~ produce a **provisional price** and a **provisional reserve price**:

3.13.1 On a business day

On a **business day**, by using the latest data given to it by 1000 hours on that day;

3.13.2 On a day other than a business day

On a day other than a **business day**, by using the data given to it by 0730 hours on that day.

3.14 Pricing manager to publish final prices and final reserve prices if r~~R~~evised data resolves ~~rectifies~~ a provisional price situation

If a ~~**provisional price situation** arises on a **business day** and by 1000 hours on that day the~~**grid owner**, or a **generator**, or the **system operator** gives~~:~~

~~**3.14.1 Revised data**~~

r~~R~~evised data in accordance with rule 3.8 (that does not itself give rise to a **provisional price situation**) ~~pursuant to rule 3.8~~; and

~~**3.14.2 Notice**~~

a~~A~~ notice in accordance with~~pursuant to~~ rule 3.9, the **pricing manager** must~~will~~ by 1200 hours on the day that the revised data and notice were

required to be given,~~of that day~~ **publish final prices** and **final reserve prices** for each **trading period** of the previous **trading day**.

3.15 Revised data gives rise to a provisional price situation

If ~~the~~ revised data providedgiven in accordance withpursuant to rule 3.8 ~~itself~~ gives rise to a **provisional price situation**, the **pricing manager** mustwill **publish** a **provisional prices** and a **provisional reserve price** in accordance with rules 3.11 and 3.12 as if no data had been received.

3.16 Grid owner, generators, and system operator ~~to exercise reasonable endeavours~~ to give revised data ifwhen a provisional price or provisional reserve price has been published

3.16.1 Revised data must be provided

If the **pricing manager** has **published** a **provisional price** or a **provisional reserve price** in accordance with rules 3.11 or 3.12, ~~the~~each relevant **grid owner**, or **generator**, or the **system operator** (as the case may be) ~~will exercise reasonable endeavours to correct the **provisional price situation** and exercise reasonable endeavours to give the **pricing manager**~~ must comply with the following:

~~**3.16.1 Infeasibility situation or SCADA**~~

~~Revised data if the **provisional price situation** arose form an **infeasibility situation** or **SCADA situation** in the case of the **grid owner**; and~~

~~**3.16.2 Metering situation**~~

~~Revised metering data in accordance with rule 3.26 if the **provisional price situation** arose from a **metering situation**,~~

3.16.1.1 Provisional price or provisional reserve price arising from infeasibility situation or SCADA situation

If the **provisional price** or **provisional reserve price** was **published** in relation to an **infeasibility situation** or a **SCADA situation**, the **grid owner** and, in the case of an **infeasibility situation**, the **system operator**, must exercise reasonable endeavours to resolve the **provisional price situation** and provide revised data to the **pricing manager**:

3.16.1.2 Provisional price or provisional reserve price situation arising from metering situation

If the **provisional price** or **provisional reserve price** was **published** in relation to a **metering situation**, the **grid owner** or the **generator** (as the case may be) must provide revised metering data in accordance with rule 3.26:

3.16.1.3 Provisional price or provisional reserve price situation arising from high spring washer price situation

If the **provisional price** or **provisional reserve price** was **published** in relation to a **high spring washer price situation**, the **system operator** must apply the **high spring washer price relaxation factor** in accordance with the **high spring washer price situation methodology** and exercise reasonable endeavours to provide revised data to the **pricing manager**.

3.16.2 Provision of revised data

The revised data required by rule 3.16.1 must be provided to the **pricing manager** by 1200 hours ~~of~~on the second **business day** following the **publication** of the **provisional price** or **provisional reserve price**.

3.17 Revised data to be accompanied by notice

If a **grid owner**, or a **generator**, or the **system operator** gives revised data in accordance with rule 3.16 to the **pricing manager**, ~~pursuant to rule 3.16, by the time provided for in that rule~~ the **grid owner**, or **generator**, or **system operator** (as the case may be) ~~it~~ must, by the time prescribed by that rule for giving revised data ~~also~~:

3.17.1 Publish notice

Publish notice that revised data has been given; and

3.17.2 Specify revisions

Specify in the~~every such~~ notice the revisions that have been made; and

3.17.3 State whether metering or SCADA situation still exists

In the case of revised data given in relation to a **metering situation** or a **SCADA situation**, Sstate in theevery such notice whether a **metering situation** or a **SCADA situation** continues to exist; and.

3.17.4 State that high spring washer relaxation factor has been applied

In the case of revised data given in relation to a **high spring washer price situation**, if the **high spring washer price situation relaxation factor** has been applied, state in the notice that the factor has been applied.

3.18 Pricing manager to publish final prices following publication of provisional prices and provisional reserve prices unless further provisional price situation arises

Subject to rule 3.18A, Iif the **pricing manager**:

3.18.1 Pricing manager Rreceives no revised data in relation to provisional price situation other than a high spring washer price situation

Does not rReceives no revised data in accordance with rule 3.16 and notice in accordance with rules 3.16 and 3.17 in relation to a **provisional price situation** (other than a **high spring washer price situation**), the **pricing manager** mustit will **publish final prices** and **final reserve prices** for all **trading periods** of the relevant **trading day** in accordance with rules 3.22 and rule 3.23; or

3.18.1A Receives no revised data in relation to a high spring washer price situation

Does not receive revised data in accordance with rule 3.16 and notice in accordance with rule 3.17 in relation to a **high spring washer price situation**, the **pricing manager** must, by 1400 hours on the second **business day** after the **provisional price** or **provisional reserve price** was **published**, **publish final prices** and **final reserve prices** for all **trading periods** of the relevant **trading day** as if the **high spring washer price situation** did not exist; or

3.18.2 Pricing manager receives revised data

Receives revised data in accordance with rule 3.16 (that does not itself give rise to a ~~resolves the~~ **provisional price situation**) and notice in accordance with rule 3.17, ~~it will~~ the **pricing manager** must, by 1400 hours on the second **business day** after the **provisional price** or **provisional reserve price** was **published**, publish **final prices** and **final reserve prices** for all **trading periods** ~~on~~ of the relevant **trading day** ~~by 1400 hours of the second **business day** after the **provisional price** was **published**~~; or

3.18.3 Infeasibility situation arising from revised data

Receives revised data ~~and notice~~ in accordance with rule~~s~~ 3.16 and notice in accordance with rule 3.17 and an **infeasibility situation** arises from that data, the **pricing manager** must, by 1400 hours on the second **business day** after the **provisional price** or **provisional reserve price** was published, ~~it will~~ **publish** notice that an **infeasibility situation** exists, specifying in the~~every such~~ notice each **trading period** affected by the **infeasibility situation**; or~~, by 1400 hours of the second **business day** after the **provisional price** was **published**~~.

3.18.4 High spring washer price situation arising from revised data

Receives revised data in accordance with rule 3.16 and notice in accordance with rule 3.17 and a **high spring washer price situation** arises from that data, the **pricing manager** must, by 1400 hours on the second **business day** after the **provisional price** or **provisional reserve price** was **published**, **publish** notice that a **high spring washer price situation** exists, specifying in the notice:

3.18.4.1 Affected trading period

Each **trading period** affected by the **high spring washer price situation**.

3.18.4.2 Binding constraints

Each **transmission security constraint** that has **bound** in the relevant **trading period** or **trading periods**.

3.18A Prohibition on notice of high spring washer price situation

The **pricing manager** must not give notice of a **high spring washer price situation** in accordance with rule 3.18.4 in relation to a **trading period** if:

3.18A.1 an **infeasibility situation** exists in that **trading period** and it has not been resolved; or

3.18A.2 the **pricing manager** has previously given notice that a **high spring washer price situation** exists in that **trading period**.

3.19 Requirements if infeasibility situation or high spring washer price situation exists

3.19.1 Grid owner to exercise reasonable endeavours to resolve~~rectify~~ infeasibility situation

If the **pricing manager** gives notice of an **infeasibility situation** in accordance with ~~under~~ rule 3.18.3,~~3 to a **grid owner**, then that~~ the relevant **grid owner** and the **system operator** must~~will~~, by 1600 hours on~~f~~ the second **business day** after~~following~~ the ~~**publication** of a~~ **provisional price** or **provisional reserve price** was **published**, exercise reasonable endeavours to resolve~~correct~~ the **provisional price situation** and ~~to~~ provide revised data to the **pricing manager**.

3.19.2 System operator to apply high spring washer price relaxation factor

If the **pricing manager** gives notice of a **high spring washer price situation** in accordance with rule 3.18.4, the **system operator** must, by 1600 hours on the second **business day** after the **provisional price** or **provisional reserve price** was **published**, apply the **high spring washer price relaxation factor** in accordance with the **high spring washer price situation methodology** and exercise reasonable endeavours to provide revised data to the **pricing manager**.

3.20 Revised data to be accompanied by notice

~~Any **grid owner** will, l~~If it a **grid owner** or the **system operator** gives revised data to the **pricing manager** in accordance with ~~pursuant to~~ rule 3.19~~, by the time provided for in that rule~~ the **grid owner** or **system operator** (as the case may be) must, by the time prescribed by that rule for giving revised data:

3.20.1 Publish notice

Publish notice that revised data has been given; and

3.20.2 Specify revisions

Specify in the~~every such~~ notice the revisions that have been made; and~~.~~

3.20.3 State whether infeasibility situation is resolved

In the case of revised data given in relation to an **infeasibility situation**, state in the notice whether the **infeasibility situation** has been resolved; and

3.20.4 State that the high spring washer price relaxation factor has been applied

In the case of revised data given in relation to a **high spring washer price situation,** if the **high spring washer price situation relaxation factor** has been applied, state in the notice that the factor has been applied.

3.21 Pricing manager to publish final prices or further ~~following receipt of rectified data~~

Subject to rule 3.21A, ~~i~~if the **pricing manager**:

3.21.1 Pricing manager receives revised data

Receives revised data in accordance with rule 3.19 (that does not itself give rise to a **provisional price situation**) ~~which resolves the **provisional price situation** and~~ notice in accordance with rule 3.20, the **pricing manager** must, by 1800 hours on the second **business day** after the **provisional price** or **provisional reserve price** was **published**,~~it will~~ **publish final prices** and **final reserve prices** for all **trading periods** of the relevant **trading ~~day~~** ~~by 1800 hours of the second **business day** after the **provisional price** was **published**~~.; or

3.21.1A Pricing manager receives no revised data

Does not receive revised data in accordance with rule 3.19 and notice in accordance with rule 3.20:

3.21.1A.1 Infeasibility situation

In relation to an **infeasibility situation**, the **pricing manager** must **publish final prices** and **final reserve prices** in accordance with rules 3.22 and 3.23; or

3.21.1A.2 High spring washer price situation

In relation to a **high spring washer price situation**, the **pricing manager** must **publish final prices** and **final reserve prices** as if the **high spring washer price situation** did not exist; or

3.21.2 Infeasibility situation arising from revised data

~~Receives no revised data and notice in accordance with rules 3.19 and 3.20 or R~~receives revised data in accordance with ~~and notice~~ rule 3.19 and notice in accordance with rule 3.20 and an **infeasibility situation** arises from that data, ~~it will~~ the **pricing manager** must **publish final prices** and **final reserve prices** in accordance with rules 3.22 and 3.23;~~.~~ or

3.21.3 High spring washer price situation arising from revised data

Receives revised data in accordance with rule 3.19 and notice in accordance with rule 3.20 and a **high spring washer price situation** arises from that data, the **pricing manager** must, by 1800 hours on the second **business day** after the **provisional price** or **provisional reserve price** was **published**, **publish** notice that a **high spring washer price situation** exists, specifying in the notice:

3.21.3.1 Affected trading period

Each **trading period** affected by the **high spring washer price situation**; and

3.21.3.2 Binding constraints

Each **transmission security constraint** that has **bound** in the relevant **trading period** or **trading periods**.

3.21A Prohibition on notice of high spring washer price situation

The **pricing manager** must not give notice of a **high spring washer price situation** in accordance with rule 3.21.3 in relation to a **trading period** if:

3.21A.1 Infeasibility situation exists

An **infeasibility situation** exists in that **trading period** and it has not been resolved; or

3.21A.2 Notice of high spring washer price situation previously given

The **pricing manager** has previously given notice that a **high spring washer price situation** exists in that **trading period**.

3.21B System operator to apply high spring washer price relaxation factor and give notice

3.21B.1 System operator to apply high spring washer price relaxation factor

If the **pricing manager** gives notice of a **high spring washer price situation** in accordance with rule 3.21.3, the **system operator** must, by 1000 hours on the third **business day** after the **provisional price** or **provisional reserve price** was **published**:

3.21B.1.1 Apply high spring washer price relaxation factor

Apply the **high spring washer price relaxation factor** in accordance with the **high spring washer price situation methodology**; and

3.21B.1.2 Provide revised data

Exercise reasonable endeavours to provide revised data to the **pricing manager**.

3.21B.2 System operator must give notice

If the **system operator** gives revised data to the **pricing manager** in accordance with rule 3.21B.1, the **system operator** must, by the time prescribed by that rule for giving revised data:

3.21B.2.1 Publish notice

Publish notice that the revised data has been given; and

3.21B.2.2 Specify revisions

Specify in the notice the revisions that have been made; and

3.21B.2.3 State that the high spring washer price relaxation factor has been applied

If the **high spring washer price relaxation factor** has been applied, state in the notice that the factor has been applied.

3.21C Pricing manager to publish final prices

If the **pricing manager**:

3.21C.1 Pricing manager receives revised data

Receives revised data in accordance with rule 3.21B.1 and notice in accordance with rule 3.21B.2, the **pricing manager** must, by 1200 hours on the third **business day** after the **provisional price** or **provisional reserve price** was **published**, **publish final prices** and **final reserve prices** for all **trading periods** of the relevant **trading day**; or

3.21C.2 Pricing manager receives no revised data

Does not receive revised data in accordance with ~~by~~ rule 3.21B.1 and notice in accordance with rule 3.21B.2, the **pricing manager** must, by 1200 hours on the third **business day** after the **provisional** or **provisional reserve price** was **published**, **publish final prices** and **final reserve prices** for all **trading periods** of the relevant **trading day** as if the **high spring washer price situation** did not exist.

3.22 Revised data cannot be given or revised data gives rise to a provisional price situation (**other than a high spring washer price situation**)

If rule 3.18.1 applies, or the revised data received in accordance with rule 3.19.1 does not resolve an **infeasibility situation** or gives rise to a **provisional price situation** (other than a **high spring washer price situation**),~~is created or is not resolved by the **grid owner** giving revised data in accordance with rule 3.19 or if rule 3.18.1 applies,~~ the **pricing manager** must~~will~~ **publish final prices** and **final reserve prices** and must~~will~~ give notice to **generators** and **purchasers**:

3.22.1 For each trading period

For each **trading period** not affected by~~subject to~~ a **provisional price situation**;

3.22.2 Information

On the basis of the information given to it pursuant to rule 3.16; and

3.22.3 By 1800 of the second business day

By 1800 hours of the second **business day** after it **publishes** a **provisional price** or **provisional reserve price**.

3.23 Where a provisional price situation (other than a high spring washer price situation) continues

If rule 3.18.1 applies, or the revised data received in accordance with rule 3.19.1 does not resolve an **infeasibility situation** or gives rise to a **provisional price situation** (other than a **high spring washer price situation),**~~is created or is not resolved by the **grid owner** giving revised data in accordance with rule 3.19 or if rule 3.18.1 applies,~~ the **pricing manager** must, ~~then~~ for each affected **trading period**~~still subject to the **provisional price situation**, the **pricing manager** will~~:

3.23.1 Give notice

No later than the time it would be required to **publish final prices** under rule 3.22, **publish** notice that it cannot calculate **final prices** and **final reserve prices**, specifying the **trading periods** affected; and

3.23.2 Calculate final prices

On the basis of the information given to it pursuant to rule 3.16, calculate and **publish final prices** for all **grid injection points** and all **net grid exit points** for each affected **trading period** by:

3.23.2.1 Assigning a price for grid injection points

Assigning a price to all **net grid injection points** for each affected **trading period** equal to the highest price at the point that the **loss adjusted demand** intersects with the **offer stack**; and

3.23.2.2 Assigning a price for grid exit points

Assigning a price to all **net grid exit points** equal to 1.05 times the price calculated for all **grid injection points** pursuant to rule 3.23.2.1 by 1800 hours on the second **business day** after it **publishes** a **provisional price** or **provisional reserve price**; and

3.23.3 Calculate final reserve prices

Calculate and **publish final reserve prices** by taking the mean of the relevant **final reserve prices** of the corresponding day in each of the four previous weeks, by 1800 hours on the second **business day** after it **publishes** a **provisional price** or **provisional reserve price**; and

3.23.4 Publish notice

Publish notice of all the **final prices** and **final reserve prices** by 1800 hours on the second **business day** after it **publishes** a **provisional price** or **provisional reserve price**.

3.24 Board notified if a provisional price situation not resolved

If a~~Whenever the~~ **grid owner** or the **system operator** receives ~~any~~ notice of an unresolved **provisional price situation** in accordance with~~under~~ rule 3.23, the **grid owner** or **system operator** (as the case may be) must ~~it will~~ immediately notify the **Board** of:

3.24.1 How the situation arose

How the unresolved **provisional price situation** arose; and

3.24.2 Steps taken

The steps taken in attempting to resolve the **provisional price situation**; and

3.24.3 Reason for inability

The reasons for the inability of the **grid owner** or **system operator** (as the case may be) to resolve the **provisional price situation**.

3.25 Board will consider

As soon as it receives a notice given under rule 3.24, the **Board** will consider the unresolved **provisional price situation** and urgently address the matters raised in the notice.

3.26 Generator or grid owner to give revised metering information following an initial estimate

IfWhere rule 3.16.1.2 applies, a **metering situation** exists the **generator** or **grid owner** that gave the **initial estimate** to the **pricing manager** in accordance with rule 3.3.2.2 must give to the **pricing manager**will give, by 1200 hours on the second business day following the day on which the initial estimate was given:

3.26.1 Half-hour metering information

Actual **half-hour metering information**;

3.26.2 Back-up metering information

If actual **half-hour metering information** is not reasonably available, **back-up metering information**;

3.26.3 Check metering information

If **back-up metering information** is not reasonably available, **check metering information** (adjusted by the **relevant registration factor** to achieve accuracy equivalent to actual **half-hour metering information**); or

3.26.4 Final estimate

If **check metering information** is not reasonably available, a **final estimate**.

IfWhere any **metering situation** arose, either in whole or in part, from the failure of a **generator** to provide **half-hourly metering information**, thethen that **generator** must will use reasonable endeavours to assist the relevant **grid owner** to provide the information required by this rule by the time prescribed in rule 3.16.2 within the time stipulated by the rule.

Appendix 3: Consideration against objectives and outcomes

Analysis of Proposal against objectives

187. The high spring washer pricing Proposal contributes to achieving the Commission's principle objectives and specific outcomes as follows:

Objectives and Outcomes	Response
Under section 172 of the Act the Commission's objectives and outcomes are as follows:	
To ensure that electricity is produced and delivered to all classes of consumers in an efficient, fair, reliable and environmentally sustainable manner; and To promote and facilitate the efficient use of electricity.	The proposed change would enhance the objective to promote efficient use of electricity by ensuring final prices, as a consumption signal, only reflected high spring washer prices when these are a realistic reflection of the physical reality of the dispatch situation. The proposed change would also improve the fairness of final prices by ensuring high spring washer prices only occur when they are a realistic reflection of the physical reality of the dispatch situation.
The Commission's specific outcomes are as follows:	
a) energy and other resources are used efficiently;	The proposed change would enhance efficient use of electricity by ensuring final prices, as a consumption signal, only reflected high spring washer prices when these are a realistic reflection of the physical reality of the dispatch situation.
b) risks (including price risks) relating to security of supply are properly and efficiently managed;	The proposed change would enhance efficient price risk management by ensuring high spring washer prices only occur in final prices when these constraints are a realistic reflection of the physical reality of the dispatch situation.
c) barriers to competition in the electricity industry are minimised for the long-term benefit of end-users;	The Proposal would reduce barriers to retail competition by ensuring spot prices are less susceptible to high spring washer prices.
d) incentives for investment in generation, transmission, lines, energy efficiency and demand-side management are maintained or enhanced and do not discriminate between public and private investment;	The proposed change would enhance incentives for investment in transmission lines, energy efficiency and demand-side management by ensuring final prices only reflect high spring washer prices when these constraints are a realistic reflection of the physical reality of the dispatch situation.

Objectives and Outcomes	Response
e) the full costs of producing and transporting each additional unit of electricity are signaled;	The proposed change would give an efficient price signal for this outcome by ensuring final prices only reflect high spring washer prices when these constraints are a realistic reflection of the physical reality of the dispatch situation.
f) delivered electricity costs and prices are subject to sustained downward pressure; and	The Proposal would enhance this outcome by reducing the occurrence of high spring washer prices in final prices due to input data inaccuracies.
g) the electricity sector contributes to achieving the Government's climate change objectives by minimising hydro spill, efficiently managing transmission and distribution losses and constraints, promoting demand-side management and energy efficiency, and removing barriers to investment in new generation technologies, renewables and distributed generation	The Proposal would be neutral for this outcome.

Q11 *Do submitters agree with the above assessment of the Proposal against the Commission's objectives and specific outcomes? If not, what alternative assessment would you propose?*

Appendix 4: Form of submission

The Commission invites submissions on the Proposal and in answer to the specific questions below by 5pm on Friday 30th June 2006.

	Question	Comment
Question 1	Do submitters agree with the problem definition as stated above? If not, then why not, and what alternative problem definition would you propose?	
Question 2	Do submitters agree that only the frequency keeping constrained on situation is worth excluding from the definition of a high spring washer price situation?	
Question 3	If not, then what other situations do you consider should be considered? (Please provide evidence to support your response).	
Question 4	Do submitters agree that the trigger value should be set from time to time by the Commission rather than specified in the Rules?	
Question 5	Should the methodology used by the system operator for relaxing the constraints be incorporated within the Rules or in a separate document outside the Rules?	
Question 6	Do submitters support the prescriptive approach to drafting of the relaxation methodology or would they prefer greater discretion for the system operator to remove incorrectly applied constraints? Please provide reasons to support your view.	
Question 7	Should the pricing process overview diagram, currently in schedule G3 of the Rules, should be retained as part of the Rules or be deleted and be provided as an information only resource directly on the Commission's website? Please state the reasons for your view.	

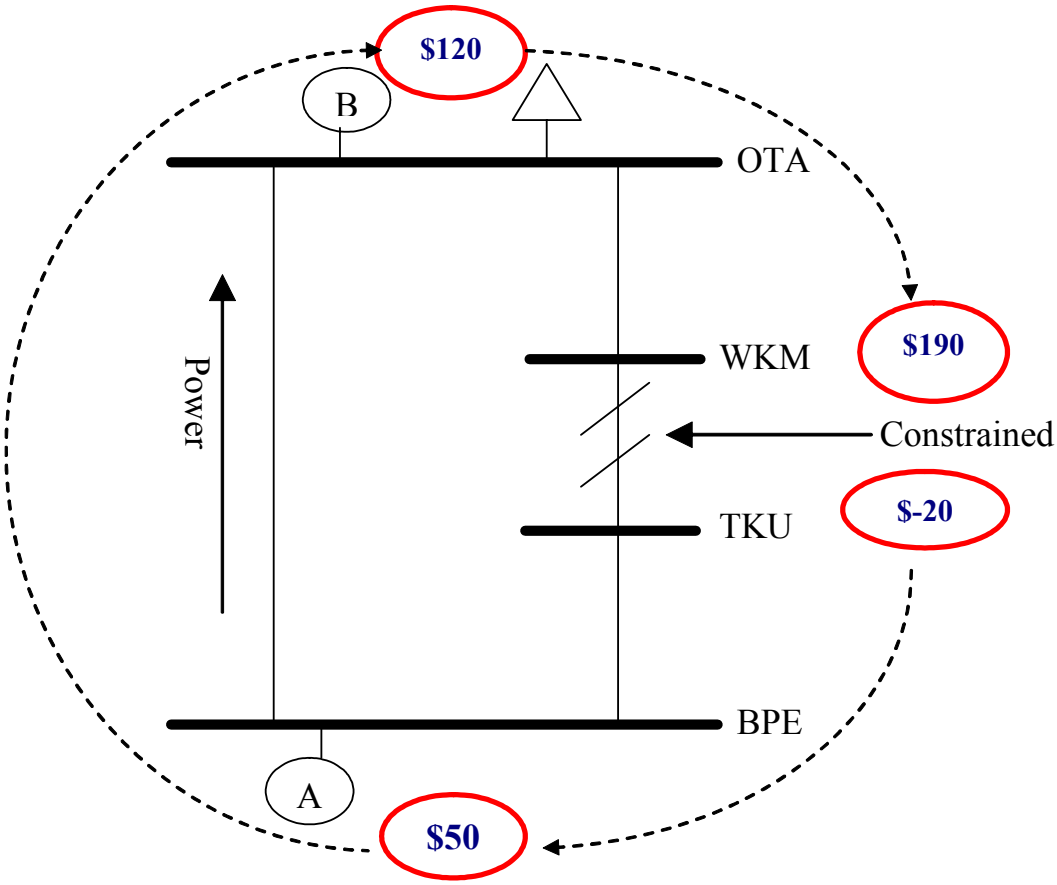
Question 8	Do submitters agree that option 1 –constraint relaxation, better meets the objectives of the Proposal than option 2 – dynamic price caps?	
Question 9	If not, please explain the rationale for your views.	
Question 10	Do submitters agree with the assumptions used in the cost benefit analysis? If not, what alternative assumptions or analysis approach would you propose?	
Question 11	Do submitters agree with the above assessment of the Proposal against the Commission's objectives and specific outcomes? If not, what alternative assessment would you propose?	

Appendix 5: Constraint pricing and spring washer effects

The spring washer effect

- Can - and does - occur whenever a constraint binding in SPD and an alternate path around the constraint exists
- Solution is valid – no non-physical quantities to solve
- Effect reflects laws of physics on power sharing
- To supply an extra MW through a constraint, the generation profile must be altered
- Price is a sensitivity - convenient to explain as the cost to meet extra MW at each node.

Example



Assume:

- A offer price = $50/MW
- B offer price = $120/MW
- equal impedances
- no losses
- BPE price = $50
- OTA price = $120
- WKM price = $190 = 2B-A

- To get one more MW of power to WKM we need to increase the output of B by 2MW and decrease A by 1MW. This is because the constraint TKU-WKM means A is unable to deliver power to WKM. So the power has to come from B. But for every MW of power from B, 2/3 flows directly to WKM and 1/3 flows down to BPE and back up the BPE-TKU-WKM path, again violating the TKU – WKM constraint. So to deliver 1MW from B to WKM we actually need to increase B by 2MW and decrease A by 1MW.
- TKU price = -$20 = 2A-B
- To get one more MW of power to TKU we need to increase A by 2MW and decrease B by 1MW. This is because for every MW of power from A 2/3 flows directly to TKU and 1/3 flows up to OTA and back down the OTA-WKM-TKU path. This flow is in reverse to the TKU-WKM constraint and relieves the constraint. Thus for every 1MW from A to TKU we can actually increase A by 2MW and decrease B by 1MW.
- It is noted that the above example is a simplified case. In practice, complex, interlocking, loops with very complicated spring washer prices can arise. Details are available from:

http://www.electricitycommission.govt.nz/pdfs/advisorygroups/wmag/pdfs16jun05/G-Reads-proj.pdf.

Appendix 6: Detailed cost benefit analysis of options

Extreme Constraint Prices - Cost Benefit Analysis

Option 1 - Constraint Relaxation

Benefits

Avoided Inefficient Generation Investment (Proportional to Loss and Constraint Rental Change)

Case	Captured by Trigger?	Loss and Constraint Rental Before Relaxation	Loss and Constraint Rental After Relaxation	Change in Loss and Constraint Rental
1	No	$ 7,571	$ 7,571	$ -
2	Yes	$ 890,532	$ 448,120	$ 442,412
3	Yes	$ 254,028	$ -	$ 254,028
4	Yes	$ 241,228	$ 24,000	$ 217,228
5	Yes	$ 908,454	$ 89,400	$ 819,054
Total Change in Loss and Constraint Retal Over 6 Months				$ 1,732,723
Annual Change in Loss and Constraint Rental (= Change inpurchaser payments)				$ 3,465,445
NPV Over 10 years @ 7%				$24,339,837

Efficiency Gains from More Accurate Locational Prices	
More accurate generator locational investment decisions	1%
More accurate purchaser locational investment decisions	1%
More accurate purchaser real time consumption decions	1%
More accurate real time production (dispatch)	1%
Total Efficiency Gains	4%
Total Benefits Over 10 Years	**$973,593**

Costs	
Implementation Costs	$ 30,000
Annual Operating Costs	$ -
NPV of Annual Operating Costs (@7% over 10 years)	$0
Total Costs Over 10 Years	**$ 30,000**
Net Benefit Over 10 Years	**$943,593**

Appendix 7: Updated pricing process overview diagram – schedule G3

Final Pricing Flow Diagrams

T I M E – Business Days

PRICE CALCULATION BEFORE 09:00 DAY0

05:00 Day 0

07:30 Day 0

P R O C E S S

Generators and Embedded Generators > Pricing manager and grid owners

Embedded, unoffered, and intermittent generation data — Rule 3.2

Grid owners > Pricing manager

Existing generation configuration
Actual demand adjusted for embedded unoffered, and intermittent generation — Rule 3.3.1, Rule 3.3.2

System operator > Pricing manager

Expected supply based on offers
Reserve offers
System Operator information for each trading period — Rule 3.3.3, Rule 3.3.4, Rule 3.3.5

Grid owner and generators > Pricing manager, generators & purchasers & ancillary services agents

Notice of delivery
Notice of SCADA situation (if any)
Notice of initial estimate (if any) — Rule 3.2.5, Rule 3.5, Rule 3.7

Pricing Manager: *Calculates prices*

If: — Rule 3.4

No infeasibility situation
No metering situation
No SCADA situation
No HSWP situation

goes to 09:00 Day 0

Or if: — Rule 3.6

A metering situation exists **and/or**
An infeasibility situation exists **or**
A HSWP situation exists

Then: — Rule 3.6

Publish notice(s) that a metering situation **and/or**
an infeasibility situation **or**
a HSWP Situation exist(s)

Or if: — Rule 3.5

A SCADA situation exists

Then:

A provisional price situation now exists

goes to 09:00 Day 0

Notes:

- All reference to rectified data implies reference to the required notices.
- A HSWP situation can only exist when no other provisional price situations exist.
- All other provisional price situations can co-exist.
- If the grid owner is required to give revised data for more than 1 trading day at a time the provision of revised data deadline is extended for each such day by 2 hours.
- If the pricing manager is required to publish final prices for more than 1 trading day at a time the price publication deadline is extended for each such day by 2 hours.

PRICE CALCULATION
BETWEEN 09:00 & 12:00 DAY0

Final Pricing Flow Diagrams

T I M E – Business Days

09:00 Day 0 | **10:00 Day 0** | **12:00 Day 0**

P R O C E S S

Grid owner > Pricing manager

Is: Rule 3.5

Notice received advising that a SCADA Situation does exist?

NO → **Pricing manager:**

Then: Rule 3.4

Publish Final Prices by 12:00

YES

Then:

A Provisional Price Situation now exists

Grid owner, system operator and generators > Pricing manager

Exercise reasonable endeavours to correct provisional status by sending rectified data to the pricing manager Rule 3.8

Pricing manager:

If: Rule 3.11

No revised data received by 10:00

→ **Pricing manager:**

Then: Rule 3.11

Publish Provisional Price using data received by 07:30
Publish Provisional Price Situation Notice
Inform the Board

Or if: Rule 3.15

Revised data received by 10:00 itself gives rise to a provisional price situation

Or if: Rule 3.13

Revised data received by 10:00 does not rectify the provisional price situation **or** itself give rise to a provisional price situation

→ **Pricing manager: Recalculates prices**

Then: Rule 3.13

Publish Provisional Price using most recent data received by 10:00
Publish Provisional Price Situation Notice
Inform the Board

Or if: Rule 3.14

Revised data received by 10:00 rectifies the Provisional Price Situation and does not itself give rise to a provisional price situation

→ **Pricing manager: Recalculates prices**

Then: Rule 3.14

Publish Final Prices

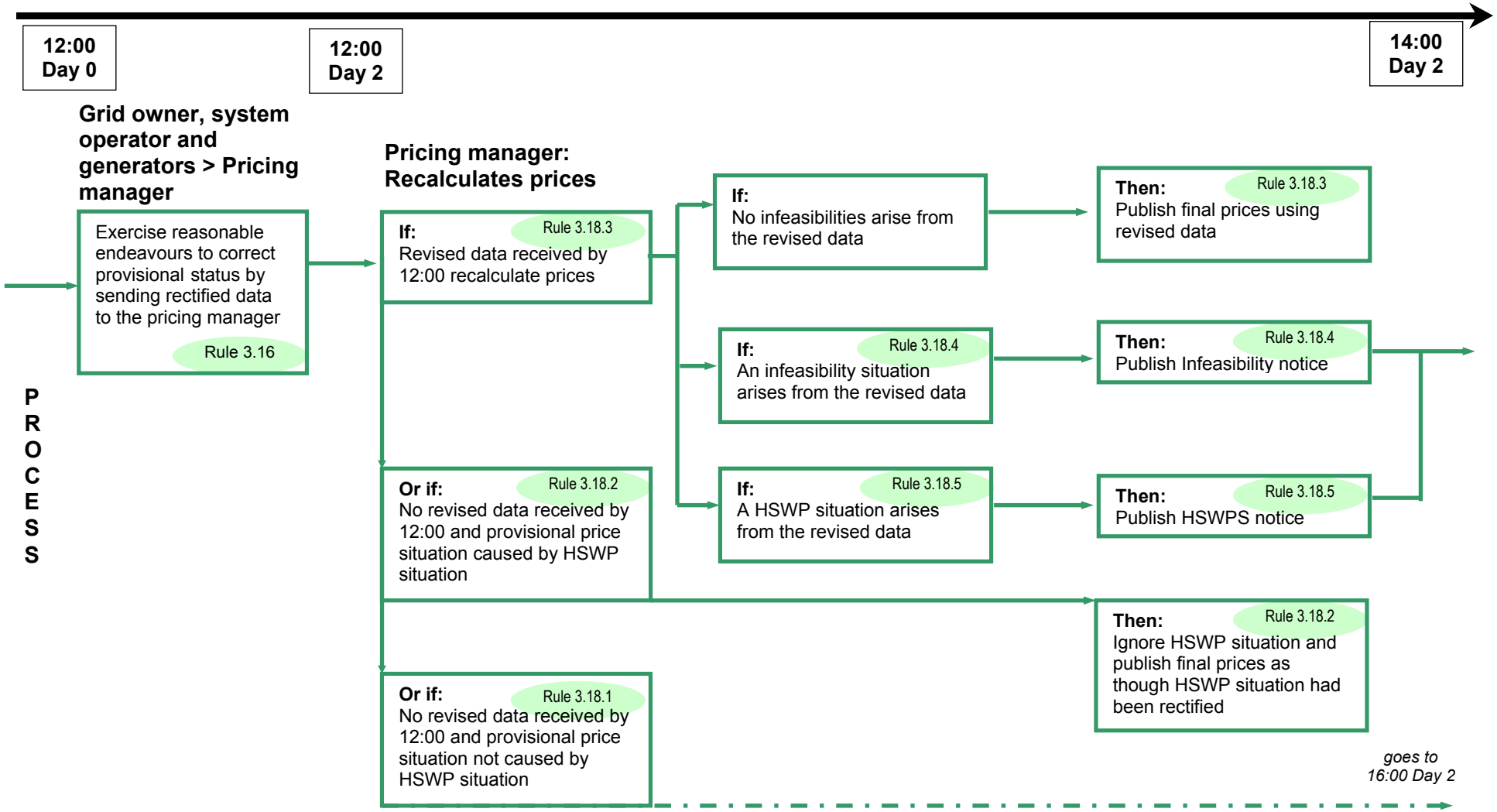
goes to 12:00 Day 0

Final Pricing Flow Diagrams

T I M E – Business Days

PROVISIONAL PRICE SITUATION AT 12:00 Day 0 to 14:00 DAY 2

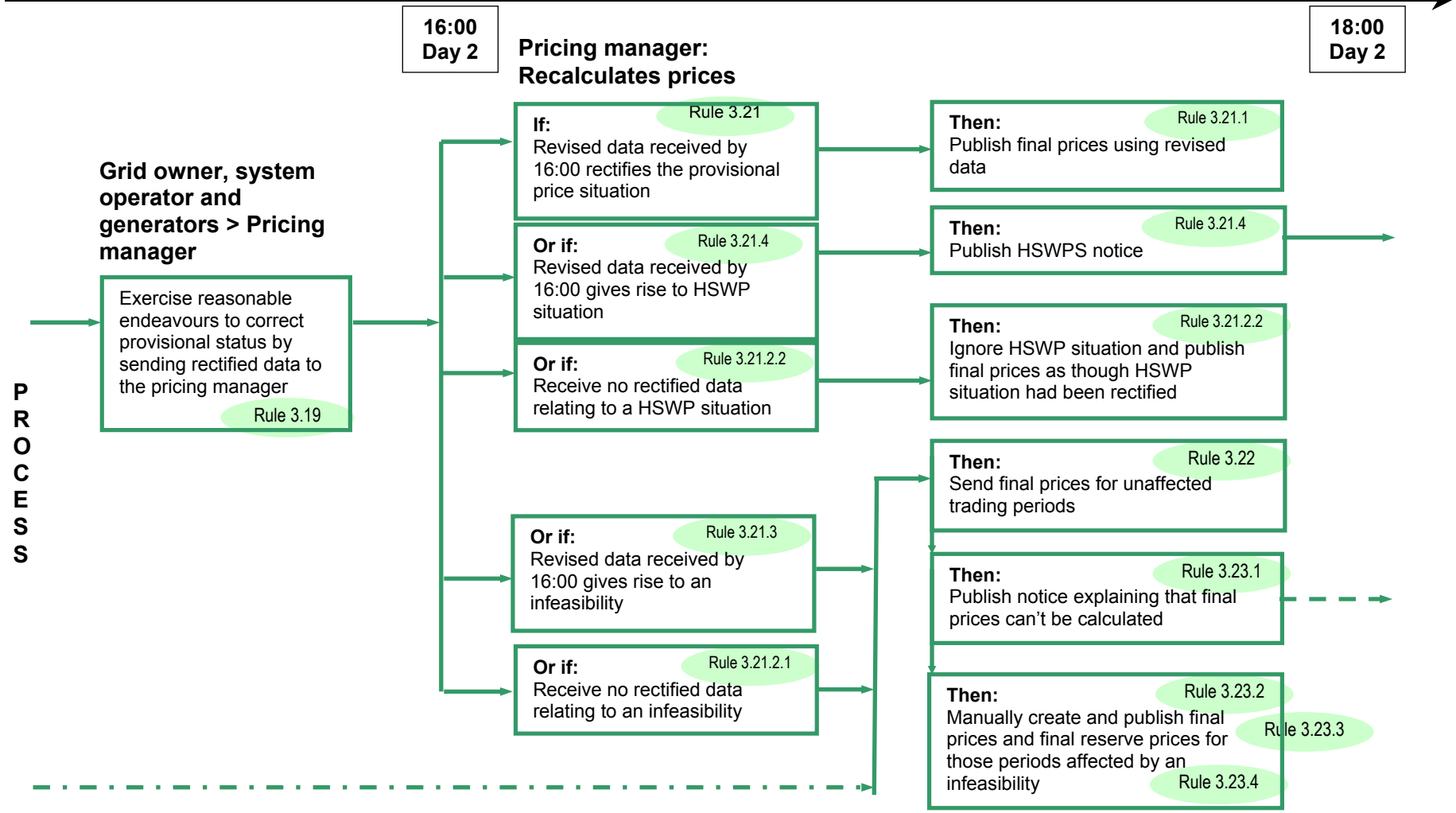
[Day 2]



Final Pricing Flow Diagrams

PROVISIONAL PRICE SITUATION BETWEEN 16:00 & 18:00 DAY 2

T I M E – Business Days



Final Pricing Flow Diagrams

T I M E – Business Days

PROVISIONAL PRICE SITUATION BETWEEN 18:00 DAY 2 & 12:00 Day 3

18:00 Day 2

10:00 Day 3

12:00 Day 3

System operator:

Apply HSWPS relaxation factor and give notice to the pricing manager that it has done so — Rule 3.21B

Pricing manager: Recalculates prices

If: Revised data received relating to a HSWP situation — Rule 3.21C.1

Then: Publish final prices using revised data — Rule 3.21C.1

Or if: Receive no revised data relating to a HSWP situation — Rule 3.21C.2

Then: Ignore HSWP situation and publish final prices as though HSWP situation had been rectified — Rule 3.21C.2

Grid owner:

Then: Immediately notify Board of how the situation arose, steps taken to resolve the situation and reasons for inability to resolve the situation — Rule 3.24

Board:

Will: Consider the unresolved provisional price situation. — Rule 3.25