Assessment of Proposed Arrangement for Self-Governance of the New Zealand Electricity Industry

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I. Introduction

1. We have been commissioned by the Electricity Governance Establishment Committee to provide economics analysis of the proposed arrangement for governing the substantial part of the electricity industry in New Zealand. Our qualifications and experience relevant to this analysis is summarised below.

2. This report assesses the relative competitive effects of the proposed arrangement and the most probable alternative. It also assesses whether public benefits from the arrangement would outweigh any deemed lessening of competition, should the Commerce Commission determine that the arrangement falls within its jurisdiction.

3. The report:

   - Reviews briefly the background to the proposed arrangement in terms of the Government's policy and legislative initiatives during 2000 and 2001 (Section II).

   - States briefly the nature of the proposed arrangement and how it relates to other current arrangements (Section II).

   - Establishes the appropriate reference framework (referred to as the counterfactual) for evaluating the proposed arrangement (Sections III and IV).

   - Assesses the competitive effects in the relevant markets compared to the counterfactual (Section V).

   - Evaluates the public benefits of the proposed arrangement relative to the counterfactual (Section VI).

   - Draws conclusions (Section VII).

4. Our main conclusions are as follows. First, our review of the statements and actions of the Government lead us to conclude that the appropriate counterfactual is regulation empowered by the Electricity Amendment Act (2001). This would involve the Government establishing a Crown Electricity Governance Board (Crown EGB). Second, after reviewing the proposed arrangement and the regulatory counterfactual, we conclude that the proposed arrangement would be pro-competitive in at least five relevant markets and neutral in other relevant markets. Third, our analysis of decision making efficiencies lead us to conclude that the proposed arrangement would confer a positive net public benefit to New Zealand compared with regulatory counterfactual.

Qualifications and experience

5. Kieran Murray is a Director of LECG New Zealand, a leading economic and finance consulting firm. He is deeply involved in the design and implementation of structural reform and market mechanisms in network industries both in New Zealand and internationally. He has served as an economic consultant on regulatory issues and the design of complex contracts for public agencies and private companies in New Zealand, Australia, United States, Canada, Singapore, and Korea.

6. His experience in the New Zealand electricity sector includes a leading role in the project teams for the Electricity Governance Establishment Project, Grid Security Project, NZEM, and advising private clients on regulatory reform. He has provided expert testimony before Select Committees of the New Zealand House of Representatives, the High Court and the New Zealand Commerce Commission.

7. His public-policy engagements have included Principal Adviser during the initial stage of the Ministerial Inquiry into the New Zealand Electricity Industry, Economic Adviser to the Leader of Opposition, member of the Prime Ministerial Task Force on Targeting Social Assistance, Economic Adviser to New Zealand's Minister of Finance, and Economist at the New Zealand Treasury.

8. Eric Hansen holds MSc and PhD degrees from the London School of Economics and Political Science. Dr Hansen has particular expertise in the economics of information and network economics and, since 1999, he has worked extensively with LECG as an independent contractor. He has substantial consulting experience in electricity, gas, telecommunications, rail, and producer boards, where he has advised on regulatory policy issues and governance structures. His experience in the electricity sector includes participation in the project teams for the Electricity Governance Establishment Project, Grid Security Project, Retail Competition Project, NZEM, as well as private clients.

9. Dr Hansen is the Chief Executive of Celtic Pacific Limited. His previous roles include Chief Economist at The Marketplace Company (M-co) and senior managerial positions at the Reserve Bank of New Zealand.

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II. Background

Ministerial Inquiry and Government response

11. In early 2000 the Government established a Ministerial Inquiry into the Electricity Industry. The Inquiry Report (June 2000) recommended changes across all major parts of the industry. It recommended that changes to market arrangements should, if possible, be achieved through private contracts between industry participants rather than by regulation.

12. The Government accepted the Inquiry's recommendations and in December 2000 issued a Government Policy Statement (GPS) on electricity stating that its overall objective is to ensure that electricity is delivered in an efficient, fair, reliable, and environmentally sustainable manner to all classes of consumers. The GPS also stated that "industry arrangements should promote the satisfaction of consumers' electricity requirements in a manner which is least-cost to the economy as a whole and is consistent with sustainable development."[1]

13. To effect the GPS, four Acts have been passed by Parliament:

- Electricity Amendment Act 2001;
- Commerce Amendment Act (No2) 2001;
- Electricity Industry Reform Amendment Act 2001; and
- Ministry of Energy (Abolition) Amendment Act 2001.

The Electricity Amendment Act 2001 is the most relevant to the economic analysis in this paper.

Electricity Amendment Act 2001

14. The Electricity Amendment Act 2001 (EAA) makes provision for the Government to over-ride any industry-established governance arrangement by establishing the Electricity Governance Board as a crown entity.[2] The Act provides for the Minister of Energy to recommend an Order in Council provided the Minister publishes the reasons for doing so and follows a process of consultation before proceeding (Section 4). The Government's stated intention is that the powers provided by the EAA will be used only if the Government is not satisfied that the industry's rules meet its needs as specified in the GPS.

15. There are circumstances where the Minister of Energy *must* commence the process for establishing the Crown EGB. This applies where the Auditor-

[1] Government Policy Statement: Further development of New Zealand's Electricity Industry (GPS), Page 1

[2] To avoid potential confusion, through out the Report we refer to the board that would be established under the EAA as the "Crown EGB" and the board that would be established under the proposed arrangement as the "Industry EGB".

General and the Parliamentary Commissioner for the Environment both give negative annual audit reports for two successive years.[3] However, while the notification and submission process must be commenced, the Minister retains discretion on whether to finally recommend an Order in Council after receiving submissions (Section 5).

Principal objective and functions of EGB

16. In the event that the Government does establish the Crown EGB, the EAA specifies the principle objective for the Crown EGB as to ensure electricity is generated, conveyed, and supplied to all classes of consumers in an efficient, fair, reliable, and environmentally sustainable manner (Section 172N).

17. The functions of the Crown EGB would be to:

- Formulate and make recommendations concerning electricity governance regulations and rules.
- Administer, monitor compliance with, enforce, and apply penalties or other remedies for contravention of electricity governance regulations and rules.
- Establish, operate, and facilitate the operation of markets for industry participants (by contracting with other parties, entering into joint venture companies or contractual arrangements or other means).
- Develop best-practice distribution pricing methodologies and other standards and model agreements for industry participants.
- Advise the Minister on matters concerning the electricity industry.
- Carry out any other functions the Minister may direct.

Accountability of electricity governance organisations

18. The EAA also provides for the Minister of Energy to set certain requirements on *any* electricity governance organisation, not just the Crown EGB. Subpart 2 of the Act provides that the Minister may set objectives and outcomes for an organisation, agree annual performance standards with that organisation, and require annual performance reports from it. Annual audits by the Auditor-General and the Parliamentary Commissioner for the Environment are also required for any electricity governance organisation designated by the Minister.

[3] Sections 172ZO(3) and 172ZP(3) define the meaning of 'negative annual audit report' from the Auditor-General and Parliamentary Commissioner for the Environment, respectively. The definition relating to the environment requires that any report where "the electricity governance organisation [proposed arrangement] has failed significantly and overall to meet the GPS objectives and outcomes concerning the environment that are affected, or could be affected, by a wholesale market or a transmission [system] … is a negative annual report..." (Sub-section 172ZP(3)).

19. The Minister has discretion whether to apply Subpart 2 to the proposed arrangement or to other arrangements.[4] It is worth noting that annual audits by the Auditor-General and the Parliamentary Commissioner for the Environment are not required if the Minister does not designate the proposed arrangement by giving notice in the *Gazette.*

20. Further details on the EAA are provided in Section III of this Report.

Summary of proposed arrangement

21. Industry participants responded to the GPS and the potential for regulation by developing the proposed new multilateral contractual arrangement that is the subject of this Application.

22. In economic terms, the proposed arrangement has two purposes:

- To provide the 'rules of the game' by which participants agree to trade with each other (e.g. provision of metering information).
- To provide a facility through which a group of participants may collectively acquire services common to all participants (e.g. market administration services).

23. To achieve these purposes within a unified structure the contract:

- Brings together all rules currently covered under existing multilateral arrangements (i.e. MARIA, NZEM, and MACQS).[5]
- Adds a new part relating to transmission services to supplement terms currently contained in bilateral contracts and 'posted terms and conditions'.
- Provides for future addition of new parts relating to other areas of activity in the electricity industry, in particular the possible inclusion of the Electricity Complaints Commission.

24. The contract establishes a governance structure (Part A), specific rules relating to the core transactions to be covered by the agreement (Parts B-H), and transition provisions to take effect for a limited period (Part I).

25. A core feature is the 'federal' structure where votes are allocated on a chapter-by-chapter basis. Apart from the governance chapter (Part A), voting rights in each chapter are allocated to those parties that are engaged in the underlying transaction governed by the relevant part of the contract. For example, the only parties with votes in the wholesale trading chapter (Part G)

[4] "The Minister may … apply this subpart to any person or group of persons involved in developing rules or standards applying to any industry participants under a contract, arrangement, or understanding between those participants …" (Section 172ZI(2)(a)). The Minister may also cease to apply the subpart to any person or group (Section 172ZI(3)).
[5] MARIA is *Metering and Reconciliation Information Agreement*, NZEM is *New Zealand Electricity Market*, and MACQS is *Multilateral Agreement on Common Quality Standards*.

are the parties who buy and sell electricity over the national grid using the rules.

Summary tables

26. Tables 1 and 2 below summarise the proposed arrangement. Table 1 lists the contents of each part or chapter of the proposed arrangement and cross-references these to the existing multilateral contracts. Table 2 lists the service provider functions and cross-references these to existing service provider contracts.[6]

Table 1: Summary of Proposed Arrangement

Sections	*Contents*	*Relation to existing contracts*
A. Governance	• Guiding Principles • Appointment & functions of the Industry EGB • Membership & voting rights • The rule making process • Supervision & compliance regime • Appointment of service providers	A new chapter that draws from MARIA, NZEM & MACQS and the GPS. Arrangements concerning the Industry EGB differ substantially from existing contracts.
B. Consumer issues	This part has been created in anticipation that the recently developed consumer complaints regime[7] or other consumer issues would be added to the rulebook after the proposed arrangement is executed by the members.	A new area that does not have counterpart in the existing multilateral contracts.
C. Quality and security	• Principal Performance Objectives (PPOs) for the System Operator • Asset Owner Performance Obligations (AOPOs) & technical codes • Ancillary services • Role & functions of System Operator	Adopts the MACQS rules largely unchanged (except for those relating to governance which are covered in Part A).
D. Metering arrangements	• Metering at grid exit & injection points • Metering at points on local networks	Adopts the MARIA rules largely unchanged but with distinction between grid-level metering and local network metering. Different parties have decision rights over

[6] The service provider functions listed are those provided for explicitly in the proposed arrangement plus a new service provider contract for 'Transport Adviser'. The latter is provided for under the rule that the Industry EGB may appoint any other person it identifies as necessary to assist it in carrying out any of its duties (section VI of part A).

[7] The consumer complaints regime has been developed by retail and distribution companies in consultation with consumer bodies and government departments.

		these two areas.
E. Registry information and customer switching	• Retailer reconciliation process • Registry performance • Information to be provided to the registry • Switching arrangements	Adopts the MARIA rules largely unchanged. The rulebook makes provision for alternative arrangements to be developed and approved by the Industry EGB.
F. Transport	Processes for: • Agreeing definition & measurement of existing transmission services • Agreeing new transmission services or changes to existing services • Developing pricing methodology	A new area that does not have counterpart in existing multilateral contracts.
G. Trading arrangements	• Bids & offers • Scheduling & dispatch • Pricing • Reconciliation	Adopts the NZEM rules but with revisions to integrate better with quality & security rules. Trading across the grid under rules similar to MARIA would not be available, except by dispensation of the Industry EGB.
H. Clearing and settlement	• Clearing & settlement processes • Prudential requirements	Adopts the NZEM rules but with extensions to include ancillary services. Some changes to prudential requirements.
I. Transition issues	Rules addressing issues that arise in the transition from existing to the new arrangement.	Some areas adopted from existing arrangements and some are specific to this arrangement.

Table 2: Summary of service provider arrangements

Service contact	*Description*	*Relation to Existing contracts*
System operator	Implements desired energy trades and achieves the PPOs by managing the real time operation of the grid within the resources made available to the operator.	The three separate contracts defined as Common Quality Coordinator (CQC) under MACQS and Scheduler and Dispatcher under NZEM are combined into one contract called the System Operator.
Registry manager	Maintains the databank of information relevant to customer switching.	The separate MARIA and NZEM registry contracts are combined into one contract.
Reconciliation manager	Gathers metering data and produces reconciled quantities.	The separate MARIA and NZEM reconciliation manager contracts are combined into one contract.

		are combined into one contract.
Pricing manager	Calculates clearing prices on the spot market.	Adopts the NZEM pricing manager contract.
Clearing manager	Calculates prudential requirements and manages the clearing & settlement process.	Adopts the NZEM clearing manager contract.
Market administrator	Administrative and advisory services to the Industry EGB and its working groups.	Adopts the NZEM market administrator contract.
Transport administrator	Administrative and advisory services to the Industry EGB and its working groups.	No service provider contract under existing arrangements.

III. Counterfactual

Basis for determining the counterfactual

27. To assess the potential competitive effects of the proposed arrangement, and any public benefits or detriments, it is necessary to establish an appropriate benchmark against which to estimate these effects. The benchmark is known as the counterfactual.

28. The counterfactual is the situation that is likely to exist over the foreseeable future (generally five years) in the absence of the proposed arrangement.[8] It is the best objective assessment of the most likely alternative scenario, not a normative view of what is desirable from the perspective of public policy or the preferences of the applicants or other parties.

29. In past decisions relating to multilateral contracts in the electricity industry the Commission has chosen alternative private contractual structures as counterfactuals.[9] In these cases, the possibility that industry contracts might be replaced by government regulatory intervention was seen as unlikely. The current situation differs from the previous cases as the Government has stated that it would regulate if the electricity industry does not adopt a suitable new arrangement.

30. The Government has once passed Acts of Parliament that provide the Minister of Energy with the powers to carry out its policy. In the GPS, issued under Section 26 of the Commerce Act, the Government "invited" the electricity industry" to move quickly to put in place the new governance structure." The Government requested progress reports and stated that: "If there has been insufficient progress, the Government will regulate to establish the Government Board."[10]

31. However, it is necessary to test the proposition that regulation is the appropriate counterfactual as some people may consider that a non-regulatory counterfactual should be adopted. This requires that we identify the parties with relevant decision rights and assess their incentives to choose between alternatives available to them.

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[8] *Guidelines to the Analysis of Public Benefits and Detriments in the Context of the Commerce Act*, Commerce Commission: Wellington, 1994.

[9] The Commission has previously made rulings with respect to NZEM and MACQS. In the case of NZEM, Decision 280 by the Commission adopted direct bilateral contracting between market participants as the counterfactual. In the case of MACQS, Decision 369 by the Commission concluded that some variant of the proposed MACQS arrangement was the appropriate counterfactual. The Commission said that it did not believe that any single alternative arrangement to the Proposal would have the necessary support of relevant parties to enable it to be implemented (para.91). The Commission also considered that the significant difference between the Proposal and the counterfactual is the time of their introduction (para 100).

[10] GPS, Page 9.

Decision rights and incentives relating to choice of counterfactual

32. This section considers how the counterfactual would be determined in the event that the Commission declined authorisation of the proposed arrangement in the current application. The main point of the analysis is to demonstrate that choosing the counterfactual to be some non-regulatory alternative contract to the proposed arrangement would be time-inconsistent and therefore not the most likely alternative.

33. Nothing in this section should be read as implying that the proposed arrangement would or should be declined by the Commission. The analysis should be read as a 'thought experiment' about how various persons might react in the event that the Commission did decline the first application.

Decision rights

34. The starting point is to note that the EAA (section 4) provides for the Minister of Energy to recommend an Order in Council to establish the Crown EGB. However, prior to making the recommendation, the Minister is to follow a consultation process lasting between 3 – 6 months (and possibly up to 12 months).[11] The Minister may begin this process at any time by giving notice in the *Gazette* (such a notice does not bind the Minister to finally recommend that the Crown EGB be established). Therefore it is possible that the process could begin before, during, or after the Commission's determination. In the following we assume that the Minister would not activate the consultation process prior to the Commission's determination.[12]

35. We therefore begin the analysis at the point where the Commission announces that the current application has been declined. The Minister of Energy has decision rights about whether to activate the consultation process as described above. Simultaneously, the industry parties have decision rights about whether or not to submit a new application and if re-submitted what changes should be made to the proposed arrangement.

36. Although their decisions potentially could be simultaneous, it is likely that the Minister would make a prepared comment or statement of his intentions fairly quickly after the Commission announces its decision. It is also likely that the industry parties would await the Minister's statement before making their own decision.

37. If the industry parties did lodge a new application, the Commission would need to determine the counterfactual relevant to the new application and make its determination accordingly.

38. It is possible that the Minister's consultation process could be concluded before the Commission's determination on the second application is

[11] Section 4(3) provides that the Minister can establish the Crown EGB without following a consultation process if the Minister considers that it is necessary or desirable in the public interest that the Order in Council be made urgently.

[12] If the Minister did initiate the process prior to determination it would add weight to the argument that the counterfactual is regulation.

announced. The Minister would decide whether to announce the Government's intentions regarding establishing the Crown EGB or await the Commission's announcement. The following analysis assumes the Minister would await the Commission's announcement.

39. In summary, if the Commission did decline the current application, the decision steps would be as follows:

Step 1: The Minister decides whether or not to activate the consultation process for establishing the Crown EGB by publishing a notice in the *Gazette.*

Step 2: Industry parties decide between three options:

(a) No submission.

(b) Submit a revised proposal.

(c) Resubmit the previous proposal.

Step 3: If (b) or (c), the Commission determines the counterfactual and whether to grant or decline authorisation.

Step 4: In all cases (a)-(c), the Minister decides at the end of the consultation period whether or not to recommend the making of an Order in Council to establish the Crown EGB.

Incentives

40. Assessing step 1 above, the Minister has stated that the Government will establish the Crown EGB if industry parties do not put in place a satisfactory arrangement. The Minister has repeated this intention regularly (including at the recent Electricity Networks Association conference in November) and Parliament has enacted the EAA to provide the powers to do so.

> "The alternative to the new arrangements is not the existing arrangements; it is regulation. If the EGEP approach fails to get industry support, I will have no option but to establish a Crown entity Electricity Governance Board and rules in a wide range of areas."

41. We find no evidence to suggest that the Government is 'bluffing' merely for the purpose of creating a 'regulatory threat'. We therefore conclude that the Minister would initiate the consultation process if the Commission declined the current application. This conclusion stands irrespective of whether the Commission's counterfactual was regulation or some non-regulatory alternative.

42. At step 3, the Commission would look forward to step 4 where the Minister finally decides whether or not to establish the Crown EGB. With the Minister's consultation process underway (as a result of step 1), the Minister's decision would be within a matter of a few months by the time the Commission makes its decision. On this basis, given the Minister's past

public statements, the Commission would almost surely assess regulation as the most likely counterfactual.

43. At step 2, the industry parties would look ahead to the Commission's decision in step 3 and conclude that the Commission is likely to choose regulation as the counterfactual. The industry's decision whether to submit a new application and whether any submission would be the proposed arrangement substantially unchanged or a version with significant revisions would depend on the counterfactual in the original application:

- If the proposed arrangement had been rejected against the regulatory counterfactual, the industry parties would either not submit a new application or submit a substantially revised proposal if consensus could be achieved. If the Minister indicated that he is proceeding with the Crown EGB it is unlikely that the industry parties would submit a new application.

- If the proposed arrangement had been rejected against a non-regulatory counterfactual, the industry parties might assess a strong probability that the Commission would authorise the proposed arrangement against the regulatory counterfactual. Given the extensive negotiations that have already occurred, our assessment is that the parties would favour re-submitting the proposed arrangement rather than re-open substantive negotiations between the parties that have been involved to date.

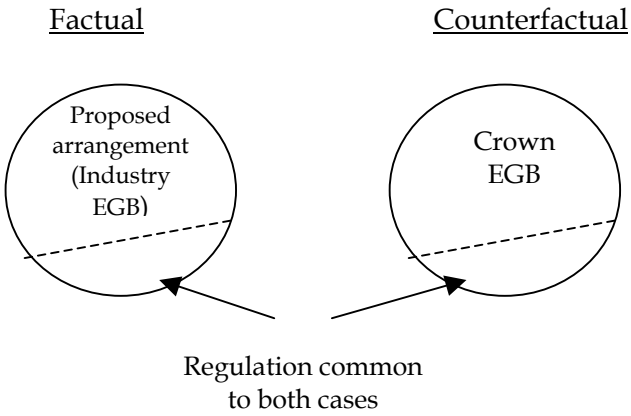
44. The step-by-step analysis above demonstrates that choosing a non-regulatory counterfactual for the current application would be time-inconsistent: If such a counterfactual led to rejection of the proposed arrangement it would merely result in the proposed arrangement being re-submitted substantially unchanged (on the basis that the new counterfactual would be regulation for reasons given above). Our conclusion is that current government policy implies that regulation is the appropriate counterfactual.

Concepts for developing the regulatory counterfactual

45. Although regulation is the most likely alternative to the proposed arrangement, the Government has not detailed the nature and form of that regulation. This section therefore establishes two key concepts for developing the regulatory counterfactual. The first concept relates to the fact that some regulations would be common to both the 'factual' and 'counterfactual', while the second concept is that the proposed arrangement and counterfactual may differ in the scope of their rules over time.

Regulation common to both cases

46. The EAA allows for wide-ranging regulations irrespective of whether the proposed arrangement is adopted and executed by industry participants. Therefore, a necessary requirement for correct comparison of the 'factual' against 'counterfactual' is to differentiate between regulation that could or would occur irrespective of the proposed arrangement and regulation that serves only to replace the functions of the proposed arrangement. This is illustrated below.



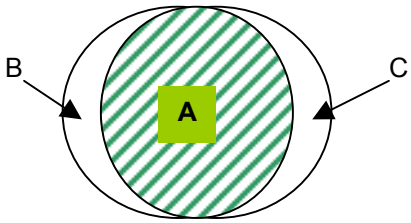
47. Regulations common to both cases include line charges, electricity trusts, ombudsman scheme for consumer complaints, consumer switching, pre-payment meters, generator connections to distribution lines, and disclosure of information in relation to hydro spill and hedge prices (section 172F). The areas where regulation differs between the factual and counterfactual relate to the wholesale market and transmission system (including quality and security).

Differences in scope of rules

48. As discussed further below (paragraphs 57 - 63), under the regulatory counterfactual an option available to the Crown EGB and Minister of Energy would be to adopt the proposed arrangement as the initial set of regulations and rules.

49. Although the initial regulations may be very close to the proposed arrangement, the counterfactual would be likely to diverge from the proposed arrangement over time. Different information, incentives, and constraints on decision-making could lead to different rules covering the same issues, to some issues under the factual not being covered under the counterfactual, and *vice versa*. Thus, the scope of the rules and regulations are likely to differ under the factual and counterfactual.

50. These arguments are illustrated below.



51. In the diagram above:

- Region A is the set of rules covered both in the proposed arrangement and counterfactual. Over time the rule specifications may come to differ, but they cover the same broad aspects of the arrangement.[13]

- Region B is the set of rules in the proposed arrangement that would not be part of the counterfactual.

- Region C is the set of rules in the counterfactual that would not be part of the proposed arrangement.

These concepts are applied below and in Section VI.

Governance structure in the counterfactual

52. The EAA defines the decision-making structure and principal-agent relationships. The Minister of Energy would set the objectives and outcomes for the Crown EGB to pursue by giving it the GPS (Section 172ZK). The Minister would negotiate annually performance standards against which the Crown EGB would be audited (Section 172ZL). The members of the Crown EGB would be individually accountable to the Minister of Energy (Section 172U).

53. The Crown EGB would have decision rights in carrying out its duties under the Act but only limited rights in relation to rules and regulations affecting industry participants and consumers.[14] The Minister would hold most decision rights, as demonstrated in the following two paragraphs.

54. First, under the EAA the Minister's right to unilaterally recommend a specific regulation or make a specific rule depends on whether the regulation or rule relates to the wholesale market/transmission system or to other matters:

- For any regulation or rule relating to the wholesale market or the transmission system,[15] the Minister could only accept or reject a

[13] The region also includes the regulations that the Minister of Energy may introduce irrespective of whether the factual or counterfactual is adopted. These regulations were illustrated in the previous diagram.

[14] The EAA distinguishes between regulations and rules. The Act provides that any issue potentially subject to regulation under the Act can also be subject to a rule, and specifies criteria for the Minister to decide whether to use a rule or regulation. The purpose of the criteria is to ensure that rules are not used when regulations would be more appropriate. While both regulations and rules require Ministerial decision, the process for making rules is intended to be more flexible than the process for making regulations, so as to obtain a wider input on technical and detail issues. However, the main difference we discern is that regulations require assent of the Governor-General by Order in Council while rules and decisions are made directly by the Minister. Other elements of rule-making process are not specified in the EAA.

[15] In terms of the proposed arrangement, this covers quality and security (Part C), grid-level metering (Part D.II), transport (Part F), wholesale trading (Part G) and clearing and settlement (Part H). Metering at sub-grid level (Part D.III), customer switching (Part E), and dispute resolution and enforcement (Part A) are not included.

recommendation made by the Crown EGB – the Minister could not propose a regulation or rule that is substantively different from a recommendation made by the Crown EGB (Section 172E(1)).

- For other regulations or rules,[16] the Minister may recommend regulations (or make rules), irrespective of whether or not the Crown EGB is established (as noted in paragraph 47) and whether or not the Crown EGB makes a recommendation.

55. Second, the EAA provides the Minister with the power to direct the Crown EGB provided such directions are consistent with the functions and principle objectives of the Crown EGB (Sections 172Z, 172ZA, 172ZB, 172ZK and 172ZL). Specifically, Section 172ZA provides that the Minister may direct the Crown EGB:

- To give effect to a government policy.
- On outcomes to be achieved by the Crown EGB.
- On the matters which the Crown EGB must formulate and make recommendations.
- On the principles or objectives for those recommendations.
- To carry out any other functions.

56. Therefore, in summary, the combined effect of the provisions in the EAA would be to make the Crown EGB an 'agent' of the Minister of Energy. The Crown EGB could not be described as an independent body protected from political influences.

Crown EGB's choice of rules

57. Upon establishment, the Crown EGB would have three choices regarding its recommendations on regulations and rules covering the wholesale market and transmission system (including quality and security):

1. Adopt substantially the rules as designed in the proposed arrangement; or
2. Adopt substantially the rules of the three existing arrangements (i.e. MARIA, NZEM, and MACQS); or
3. Develop a new set of rules, using either the existing arrangements or the proposed arrangement as the starting point.

58. The Crown EGB's choice between the three options would depend on incentives, available information, and its decision-making capability as a new

[16] These include customer switching, customer complaints resolutions, pre-payment meters, insolvent retailers, generator connections to distribution lines, hydro spill information, hedge pricing information, dispute resolution and enforcement.

crown entity. The Crown EGB's incentives would be largely determined by its performance agreement with the Minister of Energy and by its role as an agent of the Minister.

59. The Minister can reasonably be assumed to face political pressure to deliver on the desire by voters for cheap and reliable electricity and high performance service delivery. However, the experience of the previous reforms implemented through the Electricity Industry Reform Act also highlights that any regulatory intervention has potential to result in unintended consequences and therefore carries significant political risk. Given these recent experiences, it is reasonable to assume the Minister would favour a low-risk approach.

60. The Crown EGB would be cognisant of the Minister's preferences and would also acknowledge that it begins with a relatively poor information base and untested decision-making capability (though this depends to some extent on the members appointed). The Crown EGB will also be concerned to avoid undue delays in becoming operational given that the Minister has set and repeated tight deadlines for getting the new arrangements in place. Therefore, the Crown EGB would be unlikely to favour developing a new set of rules (option 3 above).

61. The course of 'minimum change' would be to adopt the existing arrangements (option 2). This would be least risky in terms of the daily operations of the electricity industry. However, this approach would not be consistent with the GPS, which specifies that a new governance board should replace MARIA, NZEM, and MACQS (paragraph 6 of GPS). It may also delay the MACQS arrangements becoming operational, because enforcement mechanisms for common quality would need to be re-designed (the enforcement mechanisms developed over the past year are predicated on a common governance structure). Adopting the existing arrangements would also make it difficult for the Crown EGB to implement the transport chapter of the rules, as this has been designed to fit within a common governance structure. For these reasons, it seems unlikely that the Crown EGB would pursue option 2.

62. The Crown EGB would be likely to assess that option 1 has low risk. The argument might be that the rationalisation of MARIA, NZEM, and MACQS as embodied in the proposed arrangement does not alter the basic mechanisms relating to scheduling, dispatch, and real time operation of the transmission system.[17] Hence, the risk of the market malfunctioning under the new rules should be low. Further, the Crown EGB might assess that specifying regulations and rules over a unified set of arrangements with common terminology and definitions reduces the chance of embarrassing gaps and inconsistencies.

[17] Nevertheless, the proposed arrangement does alter energy trading by removing the ability for parties to trade through bilateral contracts as occurs currently through MARIA. In the proposed arrangement, it is mandatory for all energy trades over the grid to go through the multilateral spot market (with rules similar to the current NZEM).

Conclusion on choice between options

63. The above analysis of the Crown EGB's principal-agent relationship with the Minister of Energy and consideration of associated incentives suggest that the Crown EGB would favour the unified structure presented by the proposed arrangement over the other two options. The Crown EGB may make some amendments to those rules, but the most likely alternative (to the proposed arrangements) is that the Crown would adopt substantively the rules as designed in the proposed arrangement

Crown EGB's choice of administrative arrangements

Working groups

64. Prior to making recommendations to the Minister, the Crown EGB would be required to consult with persons that it thinks are representative of those likely to be substantially affected by the proposed regulation or rule. The EAA does not prescribe the methods by which consultation must take place. However, given the breadth and complexity of the electricity industry, it is likely that the Crown EGB would establish relevant working groups comprising industry participants and other interested parties. The use of industry working groups to consider rules changes is well established practice in New Zealand, and is common in other jurisdictions (e.g., Australia).

Service provision

65. The EAA provides that one of the functions of the Crown EGB is to establish, operate, and facilitate the operation of markets for industry participants (section 172O(c)). The Act provides that the Crown EGB may perform this function by contracting with other parties, entering into a joint venture company or contractual arrangement, or other means. Therefore the Crown EGB would have scope to determine whether each service would be out-sourced by contestable tender or provided in-house by staff or other relational contract (e.g. joint venture).[18]

66. The Crown EGB is likely to compare itself with other countries, such as Australia where system operations and administration functions (including pricing and clearing) are performed in-house by NEMMCO.[19] It would also take into account the trend in New Zealand during the mid-1980s and 1990s toward separation of policy and operational functions, and the recent

[18] The GPS states that the Crown EGB should ensure the provision of services is contestable wherever possible. However, as discussed further in paragraphs 105 - 108, the GPS is subject to change and reinterpretation by the government of the day. Because of the inability to commit future governments, the current GPS cannot be taken as a reliable guide that service functions would be contestable in future. In this regard, it is instructive to note that Transpower's *Statements of Corporate Intent* for the three years 1998/99-2000/01 included an objective to make services contestable wherever possible but this objective has been deleted in the most recent *Statement* for 2001/02.

[19] NEMMCO is the National Electricity Market Management Company.

reversals in some areas (such as the re-merger this year of the Ministry of Health and the Health Funding Authority).

67. However, decisions regarding contestability involve wider considerations than the merits or otherwise of keeping policy and operations separate. In some cases, decisions regarding contestability might involve choices between public sector production versus private enterprise, since a properly contestable tender process would not exclude participation by private sector companies (whereas a non-contestable process provides greater scope to do so in a less transparent manner).

68. A body of literature in economics suggests that the Crown EGB would choose between contestable and non-contestable services functions so as to minimise the transaction cost of achieving its objectives.[20] In the context of public sector decision-making with, in this case, limited checks and balances (as discussed in later sections), both distribution and efficiency considerations point toward non-contestable contracts.

69. Non-contestable contracts would reduce the cost to the Crown EGB of achieving distributional objectives by:

- Not necessarily requiring detailed specification of contract (compared with contestable tender processes), and therefore less transparency of intentions.

- Provide greater scope for the Crown EGB to interpret regulations and rules (which inevitably are incompletely specified) and to change its interpretation over time with out being required to negotiate compensation for the service provider. This also favours non-transparent process.

70. The weak budgetary constraints under the counterfactual would also affect the Crown EGB's decision. The mid-1980s and 1990s trend toward separation of policy and operational functions in the public sector was aimed at reducing the risk of capture of policy by in-house operations providers (e.g. separation of health providers from health funding), whose interest is to continually expand their scope of activity. Tight constraints during government budgeting rounds forces a degree of internal competition for funds within the public sector and this tends to create an internal dynamic to reduce cost by making contracts contestable wherever this would be efficient.

71. Under the EAA (section 172ZC), the Crown EGB and service providers would be funded from industry participants through user fees and compulsory levies. Without the need to compete in government budgetary rounds, the Crown EGB would face less pressure than many other public sector entities to achieve cost savings through tendering of contestable contracts.

72. Further, in circumstances where political entities hold important decision rights (such as the Minister of Energy under the EAA), non-contestable

[20] See, for example, Horn (1995).

contracts could also be favoured over contestable contracts for some services. Two relevant factors are:

- *Commitment and risk premia*: Since the EAA provides future Ministers with wide discretion to change the regulations and rules, or alternatively to (implicitly or explicitly) cause the Crown EGB to interpret existing regulations and rules differently, bidders in contestable tenders must build in a risk premium that such changes will be made without compensation. The less the checks and balances in the regulatory system the greater the risk premium likely to be built in by private companies. In these circumstances the risk premium can be avoided by arranging provision of services in-house by the Crown EGB or by some other public agency not faced with capital market disciplines.

- *Co-location of information with decision rights:* Under the counterfactual the decision-makers (Crown EGB and the Minister) have less information than industry participants. Thus, given the assignment of decision rights, decision errors could be reduced by involving the Crown EGB in neutral service provider roles (e.g. market administration) so as to improve their understanding of the market. Put alternatively, if decision rights are not allocated to those with the best information (and incentives) then mechanisms should be created to shift information (and incentives) to those with the decision rights.

73. In summary, the discussion above suggests several reasons why the Crown EGB could favour non-contestable contracts for some services. These include the value to the Crown EGB of less transparent contracts that afford greater discretion and flexibility without revealing the cost implications and the weaker budgetary constraint arising from the compulsory levy payable to the Crown EGB. Efficiency considerations due to the inability of government to commit to regulations creating higher risk premium and co-location of information with decision rights also tends to favour non-contestable contracts in circumstances where private non-regulatory arrangements would favour contestable contracts.

74. These conclusions would appear directly applicable to the administration and system operator roles. Based on the discussion and the examples of NEMMCO in Australia and elsewhere, we assess a high probability that the Crown EGB would eventually bring market administration services in-house. The same conclusion might apply also to the Pricing Manager, Clearing Manager, and Transport Adviser functions.

75. In regard to the system operator role, which has a higher capital requirement and is more technical, the two most likely approaches are either that Transpower retains the system operator function indefinitely or the function is eventually split off from Transpower as an independent system operator (ISO). However, irrespective of which approach is chosen, the Crown EGB is likely to favour a long-term relationship with the system operator so as to facilitate the advisory role. This is consistent with Transpower's 2001/02 *Statement of Corporate Intent*, which does not promote the use of contestable contracts.

Conclusions on the counterfactual

76. On the basis of the analysis above we conclude that the most likely counterfactual to the proposed arrangement is that the Government establishes the Crown EGB as a crown entity under the EAA. The counterfactual would include elements different from and common with the factual.

77. Key elements of the counterfactual are:

- The Minister of Energy would establish the Crown EGB after following the prescribed notice and submissions process (3 – 6 months).

- The Minister would notify the Crown EGB of the GPS so that the principles in the GPS replace the Guiding Principles in the proposed arrangement.

- The Minister and Crown EGB would negotiate annual performance standards and the Auditor-General and the Parliamentary Commissioner for the Environment would report annually on achievement of those standards (under the EAA this could also be part of the factual).

- With regard to the wholesale market, quality and security, and transmission services, the decision structure would be as follows:

  - The Crown EGB would make recommendations to the Minister of Energy.

  - The Minister of Energy could accept or reject the Crown EGB's recommendations but could not propose new recommendations.

  - The Minister could not make regulations and rules in this area if the Crown EGB has not been established.

- With regard to other areas, the Minister could specify regulations and rules irrespective of whether the Crown EGB is established and irrespective of whether the Crown EGB makes a recommendation (hence, this is also part of the factual). These areas include:

  - Customer switching, customer compliant resolutions, pre-payment meters, insolvent retailers, generator connections to distribution lines, information on hydro spill, information on hedge prices, and dispute resolution and enforcement.

- The Crown EGB would adopt the operational parts of the proposed arrangement (Parts C – I) as the model for its initial recommendations to the Minister on regulations and rules and the Minister would accept this recommendation.

- The Crown EGB would review the regulations and rules against the GPS and make modifications to bring them closer to the GPS.

- The Crown EGB would establish a working group structure similar to that under the proposed arrangement.
- The System Operator service would remain with Transpower indefinitely.
- Market Administration and related services would be brought in-house.

IV. Market Definition

Principles of market definition

78. To analyse the competitive effects and public benefits of the proposed arrangement it is necessary to define the relevant markets affected by the proposed arrangement. This involves determining whether two or more products or services are within the same market or whether they form distinct markets. Conceptually, if the cross-elasticity of demand between two products is high (in absolute terms), they are part of the same market since a price change for one product has a strong impact on demand for the other product.[21] Alternatively, if the cross-elasticity is low, the products are in distinct markets.

79. The test adopted is the "ssnip test" as specified by the Commerce Commission:[22]

> *A relevant market for the purpose of competition analysis is the smallest space, defined in terms of:*
>
> > *the products or services bought and sold;*
> >
> > *the geographical area from which those goods or services are obtained and supplied;*
> >
> > *the functional level at which the transactions take place; and*
> >
> > *where appropriate, the time period;*
>
> *within which a hypothetical profit-maximising sole supplier of a good or service would impose at least a **s**mall yet **s**ignificant and **n**on-transitory **i**ncrease in **p**rice (ssnip), assuming all other terms of sale remain constant. (emphasis in original)*

Relevant electricity markets

80. The products and services suitable for application of the ssnip test may be determined by inspecting the proposed arrangement. They are as follows:

[21] The price impact on demand for the other good is positive if the two products are substitutes and negative if they are complements.
[22] *Business Acquisition Guidelines 1996, Section 3.5*

Table 3: Products and services directly affected by the contract

Contract part	*Product/service*
A: Governance	• Administration services
B: Consumer issues	• N/a (blank section at the time of application)
C: Quality and security	• Ancillary services • System coordination • Aspects of transport of electricity (transmission and distribution services) • Wholesale & retail electricity
D: Metering arrangements	• Meter services (including data administrators, meter calibrators/test houses)
E: Registry information and customer switching	• Retail electricity • Registry services
F: Transport	• Transport of electricity • Wholesale electricity
G: Trading arrangements	• Wholesale electricity • System operator services • Ancillary services • Market administration services
H: Clearing and settlement	• Reconciliation services • Market administration services • Wholesale electricity • Ancillary services
I: Transition issues	• All the above

81. Definition of the relevant markets has been considered previously by the Commission in decisions regarding NZEM and MACQS. Our analysis and conclusions are broadly consistent with those reached earlier. For this reason, the following provides only a brief discussion of each market to highlight key points. A full analysis in terms of product, functional, geographical, and temporal characteristics is provided in Annex I.

(a) Electricity

82. After applying (qualitatively) the *ssnip* test we conclude the following about the scope of the electricity market:

- Electricity is a separate market from other forms of energy such as coal, natural gas, and oil.
- Generation (or manufacturing) and wholesaling are the same market.
- Retailing may or may not be in the same market as wholesaling since large direct purchasers could switch markets at relatively low cost while for small purchasers the costs of switching may be too large (but this distinction is not important for the analysis).
- Spot and hedge contracts are within the same market.
- For the large majority of trading periods the electricity market is the whole of New Zealand: transmission constraints that could create separate regional markets occur only a small percentage of time (see Annex I).
- Each half-hour trading period is a distinct market, as indicated by the daily profile of trough and peak prices on the spot market. This could change in future as technology advancements reduce the cost of demand-side management.

(b) Transport of electricity

Product markets

83. Electricity is transported over the high-voltage transmission grid to distribution nodes (grid exit points), where it is 'stepped down' to a lower voltage and distributed to residential and commercial users. The potential substitutes for transport of electricity are:

- Locating generation close to demand sources (e.g. building a generation station near Auckland).
- Locating major users close to supply (e.g. locating a smelter near the hydro lakes).
- Demand-side management to reduce peak flows.

84. However, substitution possibilities are mainly limited to increments in capacity. To substitute for transmission, generation would need to run at times when the transmission system was constrained, which may not necessarily coincide with high electricity prices. The *ssnip* test therefore implies that electricity transport services are not in the same market as energy supply. The test also implies that the transmission market is determined geographically by nodes that interconnect the generators, distributors and end consumers.

(c) Ancillary services

85. The main ancillary services are instantaneous reserve, frequency control reserves, over-frequency arming, voltage support, load shedding, and black start.[23] We assess that each ancillary service is a separate market.

86. We also adopt the Commission's previous assessment (Decision 369) that instantaneous reserves (and other ancillary services) are in a separate market from the energy market.

(d) System operator services

87. The system operator service arises from the need to maintain a balance between injection and off-take of energy from the grid. If an imbalance in demand and supply persists, the frequency (or voltage) on the grid deviates from normal levels and ultimately can damage the generators and other assets connected to the grid. The system operator instructs energy suppliers and ancillary services to increase or reduce supply to maintain quality.

88. With no substitute services available, a single seller would profit by imposing a ssnip. System coordination is therefore a service market that is separate from other markets.

(e) Other services

89. Buyers and sellers of electricity (and ancillary services) may lower transaction costs by utilising intermediary services to facilitate search, price discovery, and settlement. This applies particularly to generators, retailers, and large consumers. The services provided include:

- Meter services (potentially including sub-markets for installation, maintenance, reading, and testing of meters).
- Reconciliation service.
- Market administration service.
- Pricing service.
- Clearing service.
- Registry service.

90. Although participants may avoid some services through bilateral contracting and vertical integration, we assess that a single seller of each service would profit from a snipp. Therefore, each service is a separate market. These are discussed in greater detail in Annex 1.

Conclusions on relevant markets

91. The analysis above (and in Annex I) implies that the relevant markets are:

[23] Definitions are provided in Annex I.

- Electricity for the whole of New Zealand (for most trading periods), with a possible functional distinction between wholesaling and retailing markets.
- Transport
- Each ancillary service
- System coordination
- Each of the other services, being:
  - Meter services
  - Reconciliation services
  - Market administration services
  - Pricing services
  - Clearing services
  - Registry services

92. While we have identified that wholesaling and retailing may be separate markets, it is convenient for the purposes of the competition and public benefit analysis that follows to refer simply to 'the electricity market'. We assess that this approach is without loss of generality in the context of the current application. Similarly, while the various 'other' services may be identified as separate markets, we refer to them collectively unless noted otherwise.

V. Competition in the relevant markets

93. This section evaluates the competitive impact of the proposed arrangement relative to the counterfactual specified in section III. The generic issue is whether the proposed arrangement would be pro- or anti-competitive relative to the regulations and rules that would be implemented under the counterfactual.

The basis for comparison

94. Our approach is centred on competition as a process that occurs as firms vie for profit and consumers seek to maximise consumer surplus. In order to improve their well being, individuals engage in exchange with others, utilising the rights they may hold over various forms of capital, including human and physical capital. Economists usually call the gains from such co-operation, or exchange, the "gains from trade". As with any form of co-operation, the mutual gains available from market exchange depend on the nature of the institutions surrounding the market. These institutions include the rules, both formal and informal, that define the rights of individuals participating in exchange.

95. Organised markets, such as the proposed arrangements, comprise a particular form of institutional arrangement for carrying out market exchange. In *The Firm, the Market and the Law*, Ronald Coase gives an account of the nature, development, and benefits of organised markets.[24] He begins with the following fundamental observation:

> *"Markets are institutions that exist to facilitate exchange, that is, they exist in order to reduce the cost of carrying out exchange transactions."*[25]

96. By reducing the costs of exchange, organised markets increase the gains from trade and thus widen the opportunities for trade. Coase goes on to observe that:

> *"All exchanges regulate in great detail the activities of those who trade in these markets (the times at which transactions can be made, what can be traded, the responsibilities of the parties, the terms of settlement, etc.), and they all provide machinery for the settlement of disputes and impose sanctions against those who infringe the rules of the exchange. It is not without significance that these exchanges, often used by economists as examples of a perfect market and perfect competition, are markets in which transactions are highly regulated (and this is quite apart from any government regulation that there may be). It suggests, I think correctly, that for anything approaching perfect competition to exist, an intricate system of rules and regulations would normally be needed."*[26]

97. An intricate system of rules comprising an organised market give rise to a concern from a competition perspective when their purpose is not to promote

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[24] Ronald H Coase, *The Firm, The Market and The Law*, Chicago University Press, 1988, at pp. 7-10.
[25] Ibid. at p7.
[26] Ibid. at p9.

or facilitate competition, but to impede competition though creating artificial barriers to entry and constraining competitive pricing. Such mechanisms may be implicit and adopted voluntarily through tacit collusion based around some constraining device or they may be imposed explicitly through rules and regulations that constrain firms from responding in particular ways to market developments.

98. The relevant comparison, in assessing whether the arrangements might impede competition, is with the counterfactual specified in section III. A key feature of the counterfactual is that the initial regulations and rules would be substantively the same as the rules specified in the operational parts of the proposed arrangement (i.e. Parts C – I). Therefore, at least initially, the competitive impact of the proposed arrangement should be neutral with respect to the counterfactual. Any divergence in competitive impact would occur only over time as the rules in the proposed arrangement evolve differently from the way the regulations and rules would evolve in the counterfactual.

99. An assessment of the competition implications of the rules therefore requires a focus on the rule making process going forward. In this regard, it may be noted that decision-makers in both the factual and counterfactual could make two types of error in relation to competition:

(a) Adoption of a rule that lessens competition (new entry barriers or rules that limit coordination devices).

(b) Failure to adopt a rule that would enhance competition (failure to remove entry barriers and/or coordination devices).

100. The propensity to make these decision errors depends on the information available to decision-makers, and the incentives and constraints they face. Decision-makers with poor information are more likely to make errors, and constraints are important for protecting against anti-competitive decisions. Incentives are important for motivating decision-makers to adopt measures that enhance competition.

101. The following evaluation applies these concepts first to the general case and then with respect to each relevant market.

General assessment

Constraints against competition-lessening rules in the proposed arrangement

102. Under the proposed arrangement the main constraints against lessening of competition through future rule changes (type (a) errors) would derive from the guiding principles, voting structures (there is a collective interest in maximising the gains from trade) and continued oversight by the Commission.

103. The guiding principles are an important constraint against competition-lessening rules due to the ability of the Rulings Panel (on application from any person) and the Industry EGB (at its own initiative) to strike down a

proposed rule change as contrary to the guiding principles. The 75% super majority required to change Part A of the proposed arrangement embeds these 'strike down' provisions. Specific guiding principles that protect against lessening of competition through future rule changes are:

- Guiding principle 1, bullet point 3, which promotes the removal of all unjustifiable impediments to entry by new producers and users of services, to users switching between suppliers for services, and to the conduct of transactions between parties.

- Guiding principle 1, bullet point 2, which promotes individual decisions by entities on the purchase and supply of services that may be commercially or technically isolated to individual entities.

- Guiding principle 3, which fosters competition in the retail market, wholesale market, between alternative trading arrangements, and for the provision of ancillary and other services to the market.

- Guiding principle 5, which favours membership of individual sections of the rulebook being voluntary except where an improvement to economic welfare can be attained only from mandating membership, and limits the scope of any mandatory sections only so far as is necessary to achieve the identified improvements to economic welfare.

- Guiding principle 8, bullet point 1, which requires that the process by which the rules evolve should limit the potential for any person to amend the rules in a manner that introduces unjustifiable bias.

- Guiding Principle 10, which requires that all rules must comply with the law, including the Commerce Act.

104. The risk of anti-competitive rule changes under the proposed arrangement would also be limited by the allocation of voting rights. The allocation of voting rights in each part of the rules to the 'buyers and sellers' engaged in the underlying transaction is a key protection in the proposed arrangement. In particular, a proposed rule that would lessen competitive pressures would be detrimental to the purchasing parties and they would vote according to their interests.

Lack of constraints in the counterfactual

105. The counterfactual does not incorporate these protections. In particular, the GPS principles notified to the Crown EGB can be changed by the government of the day. Any rules made under regulation would not be subject to strike down by the Rulings Panel, the Industry EGB, or by the Commission.

106. It is instructive to note that the Government is currently reviewing the GPS as part of its post-winter review of the electricity market. The Government's announcement that it may alter the GPS came less than one year after the 'final' GPS was announced following the Ministerial Inquiry into the Electricity Industry. While the nature and scope of change is not yet known, the fact that it is being reviewed so soon after the major Inquiry in 2000

highlights the potential for the GPS to be quite unstable. In contrast, the guiding principles in NZEM have remained unchanged since operations began in 1996.

107. More generally, a substantial body of economics literature concludes that regulators and political entities would be unable to commit to a stable set of rules under the counterfactual.[27] Moe (1990, p.227) comments on this commitment problem as follows:

> *"In democratic polities (and most others), public authority does not belong to anyone. It is simply "out there", attached to various public offices, and whoever succeeds under the established rules of the game in gaining control of these offices has the right to use it. …While the right to exercise public authority happens to be [with existing office holders] today, other political actors with different and perhaps opposing interests may gain that right tomorrow, along with legitimate control over the policies and structures that their predecessors put in place. Whatever today's authorities create, therefore, stands to be subverted or perhaps completely destroyed – quite legally and without any compensation whatever – by tomorrow's authorities."*

108. In competition terms, the implication is that a future government that wished to promote other objectives at the expense of short- or long-term competitive pressures would be able to do so with few constraints.[28] The wide scope of Ministerial authority under the EAA removes most of the checks and balances that apply to the legislative process in New Zealand. The absence of Commerce Commission jurisdiction under the counterfactual is a further weakness as the recognition of political hazards is a major reason why competition authorities are established to operate independently of government.

Incentives to promote competition in the proposed arrangement

109. Under the proposed arrangement the probability that new rules designed to enhance competitive pressures may fail to be adopted (type (b) errors) depends on the incentives of the voting parties. The parties on the purchasing side would have a strong incentive to identify and promote increased competitive pressure between suppliers (and *vice versa*). The Industry EGB would be charged with formulating annual work plans aimed at continually enhancing the rules in terms of consistency with the Guiding Principles. As emphasised by Guiding Principle 3, competition is an important driver in the rules.

110. The incentives of the parties on the selling-side would depend on their assessment of relative advantage. The sellers who believe they possess competitive advantages over other sellers would tend to favour removing impediments to competition, while the sellers who perceive weakness would not favour increased competition. With the exception of Part C (quality and security) and Part F (transport), a rule change requires only a majority vote

[27] See, for example, Spulber (1989), Moe (1990) and Horn (1995).
[28] The following discussion of competition in each of the relevant markets provides specific examples of rule changes that would lessen competition.

across all parties eligible to vote, so that a positive vote by all purchasers plus only one seller is required to achieve the 50% majority.[29]

111. A possible issue in this analysis is that some major participants are vertically integrated in generation and retail businesses. However, it is not correct to presume that large integrated companies would vote against competition-enhancing measures or that small generation or retail companies always favour competition. A vertically integrated company internalises decisions that would otherwise have been externalised. It is not obvious why a decision that would be supported (opposed) by separate entities as in (against) their joint interest, would not be supported (opposed) by the combined entity.

Incentives to promote competition in the counterfactual

112. Under the counterfactual, the Crown EGB and Minister of Energy would have incentives to promote increased competition on a long-term sustainable basis. This is reflected in the current GPS (December 2000):

- Guiding principle 'h', which states that the rules are to promote enhanced competition wherever possible and, where it is not, seek outcomes that mirror as far as possible those that would apply in competitive markets.

- Guiding principle 'n', which states that the Crown EGB should ensure that the provision of services is contestable wherever possible.

113. However, as discussed above, the Government is not able to commit that these guiding principles would not be changed or interpreted differently in future. The likelihood is that the emphasis on competition would be unstable over time. While some governments would be likely to place strong emphasis on principles of competition, other governments or the same government at different point in the electoral cycle or facing a change in the external environment could place considerably less emphasis on competition.

114. For example, depending on the constituency, political incentives may be weighted more heavily at times toward other objectives such as encouraging the use of renewable resources, codifying service standards, and protecting employment in companies without competitive advantages. And similar to other regulatory authorities, such as in Australia and California, a future Minister of Energy might succumb to pressure to cap prices in the wholesale market. These actions may serve particular short-term goals but would be detrimental to competitive pressures in the long run.

Conclusions

115. Since the proposed arrangement and the counterfactual are assumed to begin with similar rules, the issue is how the rules may evolve differently under the different decision-making structures. The proposed arrangement embodies

[29] This contrasts with NZEM where majority vote is required in each class. Hence, in NZEM a majority of sellers could prevent a rule change whereas this is not the case in the proposed arrangement.

important constraints against anti-competitive rule changes while the parties that would benefit from increased competition have incentives to identify and promote relevant rule changes.

116. Our assessment is that the "triple constraints" under the proposed arrangement – strike down against the guiding principles, voting by the parties to the underlying transaction, and continued jurisdiction of the Commerce Commission – would act as powerful impediments against lessening competition through rule changes under the proposed arrangement. The counterfactual does not have equivalent constraints since the government of the day could issue a new GPS, could vary the weights on objectives through annual performance agreements, and - additionally - any regulations made by the Minister would not be subject to oversight by the Commission. Continuing and consistent emphasis on competitive pressures cannot be assured under the counterfactual. For these reasons, our assessment is that in general terms the proposed arrangement would be strongly pro-competitive relative to the counterfactual.

Assessment for relevant markets

117. By defining the terms upon which electricity industry participants may utilise common services and engage in trade with each other, the proposed arrangement potentially could have a substantial impact on competition in a wide range of electricity markets. In this section we carry through the earlier assumption that the proposed arrangement and counterfactual would have the same rules initially but may diverge over time. Therefore, while the initial competitive impact on the relevant markets would be neutral, the forward-looking assessment may be pro- or anti-competitive. The following considers in turn each of the relevant markets.

(a) Electricity

Entry barriers

118. The current GPS suggests specific changes that may be made to the counterfactual that would raise entry barriers relative to the proposed arrangement. For example, the Government has given emphasis to energy efficiency and minimisation of greenhouse gas emissions. This is reflected in the GPS by guiding principles g and j and in the EAA by the special auditing role assigned to the Parliamentary Commissioner for the Environment (see section 172ZP). The counterfactual provides greater scope for a future Minister of Energy to introduce rules that favour these energy efficiency and environmental activities. For example, the Minister could follow the example of the Australian NSW government by requiring retailers to provide a percentage of their supply from renewable resources. Alternatively, the dispatch rules could be tilted in favour of generators supplying energy from renewable resources, so that dispatch ceases to be entirely merit-based. Rules of this nature would be entry barriers for entities that do not meet the specified criteria.

Coordination mechanisms

119. The GPS also provides indications of measures that the government would seek from a Crown EGB that may constrain competitive responses. For example, the GPS (para.15) says that the EGB should ensure that information on offers by generators for dispatch is released publicly after three months. Implementation of this proposal would carry two risks:

- *Tacit collusion:* the released data provides information to generators on offer strategies followed by competitors that might not be available otherwise. Delayed release reduces but does not eliminate this risk.

- *De facto* price cap: customer reaction against particular generators limits their willingness to price electricity at opportunity cost during supply shortages. This is a form of implicit 'price-fixing'. Price fixing would discourage entry of peaking generators and ultimately serve to increase the probability and duration of supply-shortages (which is precisely when the risk of non-competitive pricing is the highest).

Uniform standards

120. The proposed arrangement provides for parties to be exempted from the rules in the following areas:

- Equivalence arrangements in common quality (part C), where a party can apply to the system operator to have a bilateral arrangement with another party accepted as offsetting its obligations under that part.

- Dispensations from the Asset Owner Performance Obligations (part C), where parties can apply to the system operator for existing plant to be exempt from new performance obligations.

- Distributed generation, where any parties trading over distribution networks who do not inject or off-take from the transmission grid are exempted from the trading and clearing and settlement rules in parts G and H.

- Dispensations from bids & offers and scheduling & dispatch in part G, where a party may apply to the EGB for dispensation from full compliance on the basis of net public benefits.

In addition, the rules on metering (part D) and customer switching (part E) provide for substitute trading arrangements to be adopted by the EGB as an alternative to the proposed arrangements.

121. These provisions have potential to reduce considerably the impact of specified standards on entry barriers and competitive behaviour toward innovation. The granting of dispensations to multiple parties may create pressure for secondary arrangements to be developed and adopted under the

rulebook in some areas. For example, in the trading area we assess that a new bilateral trading arrangement could re-emerge over time.[30]

122. We assess that the proposed arrangement is more likely than the counterfactual to make full and proper use of the dispensations provided for in the rules. Regulators, such as the Crown EGB, generally prefer to apply rules uniformly so as avoid risk of being accused of bias and encouraging lobbying behaviour by participants.[31] On this basis, we assess that the proposed arrangement would better achieve the intended benefits in terms of lower entry barriers and improved ability for innovation by participants.

123. We conclude, therefore, that the greater level of constraint in the proposed arrangement against *ad hoc* changes in the rules results in it being pro-competitive relative to the counterfactual.

(b) Transport of electricity

124. Electricity is transported by the national transmission grid and distribution network companies. Historically, and currently, the transmission and distribution markets have been served by a single seller in their region. The proposed arrangement includes rules relating to transmission, but not distribution.

Entry barriers

125. A core feature of the transport section (part F) of the proposed arrangement is the emphasis on defining the service measures for transport. This is critical for effective competition at the margin where transmission expansions are being considered, since ill-defined service measures make it difficult to compare the relative cost of alternative solutions. Under the proposed arrangement, the buyers of transmission services would have strong incentives to seek clarity of service definitions to enable them to choose the most cost-efficient solution.

126. Under the counterfactual, the Crown EGB would arrange funding for expansions in transmission services through compulsory levies. The Crown EGB would face less pressure than purchasers to keep costs to a minimum and would be likely to consider political risk and other factors. There is a high risk that the Crown EGB would face pressure to assume the role of 'investor of last resort'. The current GPS suggests that the Crown EGB should undertake such a role, and authorise investments by Transpower when such investments are viewed as necessary to maintain security. Transpower would have a right to recover the costs of any investments authorised by the Crown EGB.

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[30] Current industry arrangements provide for bilateral trading through MARIA and multilateral spot market trading through NZEM. The proposed arrangement and counterfactual will both require all trading through a mandatory spot market that is very similar to NZEM. The scope for bilateral trading will be limited to financial contracts.

[31] Equally, with the provisions in place, some participants may have an incentive to lobby the Minister for dispensations that do not meet the specified criteria.

127. The proposed arrangements constrain the ability of the Crown EGB to override investment decisions to limited circumstances (see Section II of part F). Investor of last resort type functions weakens incentives on the parties involved. The transmission provider will generally find it easier to make its case to the Crown EGB (rather than to informed customers), and the Crown EGB will err on the side of approving investments – it faces little downside in authorising an investment but considerable risk if it turns down an investment that subsequently proves necessary.

128. As transmission investment decisions can become politicised, a Crown EGB would face considerable pressure to take a more 'hands-on' approach to transmission investment. This suggests that a Crown EGB would focus less on defining service outputs and more directly on securing the investment inputs to keep risk at "acceptable levels". If this occurred, the counterfactual would be less effective than the proposed arrangement in reducing entry barriers to substitute providers such as generators and demand-side management.

Uniform standards

129. Uniform standards, especially technical requirements, may be efficient when output or service standards are difficult to define or measure, or where the implications of non-compliance are significant. However, centrally administered systems tend to place much greater emphasis on uniform standards, than do more disaggregated systems. This is because it is much less complicated to administer a few standards centrally.

130. The counterfactual would entail greater central decision-making (the Minister and the Crown EGB would hold most decision rights) than the disaggregated decision making in the proposed arrangements (where most decision rights are retained by the participants). Because key decisions would be centralised, the counterfactual would likely result in greater use of uniform standards and this would tend to inhibit innovation by potential competitors.

(c) Ancillary services

131. The rules in the proposed arrangement and the counterfactual relating to the provision of ancillary services would be the same initially. Under both approaches all ancillary services would be provided through competitive bidding processes.[32]

132. Looking forward, the proposed arrangement would be pro-competitive relative to the counterfactual due to stronger constraints against future rule changes that could introduce entry barriers or inhibit competitive processes (for example, to favour ancillary services provided by renewable resources). Also, introduction of improved contracting arrangements would tend to be slower under the counterfactual due to the lack of consistent emphasis on competition and efficiency as discussed above.

[32] Instantaneous reserve is supplied through the same offer mechanisms that apply to the wholesale spot market (i.e. NZEM). Other ancillary services are supplied through tender of contestable contracts.

Entry barriers

133. An area of concern is the potential to better integrate ancillary services with the energy market. Currently, instantaneous reserves are bid into the spot market on a half-hour basis but other ancillary services such as voltage support are supplied through term contracts. The restricted form of contracting is an entry barrier to parties who are better suited to short-term supply arrangements.

134. Under the proposed arrangement the decision-makers are potential suppliers of service and would gain if better integration of voltage support into the spot market would improve efficiency. Therefore, the proposed arrangement would be likely to extend the spot market to include voltage support at an earlier stage than would occur under the counterfactual (where emphasis on competition and efficiency would be variable).

(d) System operator services

135. Both the proposed arrangement and the counterfactual would establish a single coordinator of the national grid. Under both arrangements, Transpower would be appointed as the initial System Operator.

136. The proposed arrangement provides the Industry EGB with discretion to agree the terms and conditions of each service provider contract without requiring a vote of members. In the case of the System Operator, the terms and conditions of the first System Operator contract are currently being negotiated with Transpower. The duration of the first contract and any possible terms relating to roll over of the contract have not yet been agreed. It is therefore uncertain whether or when the first contestable tender would be held.

137. Nevertheless, the Industry EGB would observe that the feasibility of the system operator role being performed by parties other than the transmission provider has been demonstrated in electricity markets overseas (e.g. Australia, Canada and USA). The Industry EGB also has an incentive to align its approach with the interests of the members and therefore has a strong incentive to ensure the System Operator contract is contestable if this is efficient.

138. Under the counterfactual the Crown EGB would be more likely to favour a long-term relationship with the system operator so as to facilitate the advisory role (see paragraphs 65-75). This could take the form of either Transpower retaining the system operator function indefinitely or it being split off as a permanent independent system operator (ISO).

139. Hence, we assess that the proposed arrangement would be pro-competitive relative to the counterfactual.

(e) Other services

140. Under the proposed arrangement, the Industry EGB has discretion to decide whether some or all services should be provided in-house rather than by

contestable contract. However, the Industry EGB would take account of the views of members, and they would be likely to favour external contracting to ensure best price/performance and the cost of rule changes is transparent. Therefore, it is likely that the Industry EGB would shift some or all of the services in-house only if it could demonstrate a net value gain.

141. In contrast, the discussion in Section IV suggests that the Crown EGB would be more likely to bring some services, such as market administration, in-house on a non-contestable basis. On this basis, the proposed arrangement would be pro-competitive relative to the counterfactual.

142. Other services, such as metering, would offer the Crown EGB few of the discretionary and information benefits identified in Section IV. On this basis, the proposed arrangement would be neutral relative to the counterfactual.

Conclusions on competitive effects

143. Analysis of both the general issues and the specifics of the relevant markets suggest that the proposed arrangement would be pro-competitive relative to the counterfactual.

144. Although the factual and counterfactual are assumed to begin with similar rules, the incentives and constraints embodied in the proposed arrangement would establish a more robust basis for preserving and enhancing competitive pressures. In particular, our analysis has identified a set of 'triple constraints' that would be absent under the counterfactual. These include lack of constraints regarding the issue of a new GPS (and changes to the annual performance agreements), lack of strike down against the guiding principles, and being outside the jurisdiction of the Commerce Commission. The counterfactual also embodies incentives that are likely to result in the focus on pro-competitive rule changes being inconsistent and unstable over time.

145. For the relevant markets, our conclusions are:

- *Electricity*, pro-competitive because the counterfactual would provide greater scope for a future government to favour suppliers with particular characteristics (e.g. environmental).

- *Transport* (transmission), pro-competitive because the counterfactual would be likely result in higher entry barriers and less innovation due to poorer definition of services and less concern for cost-minimisation.

- *Ancillary services*, pro-competitive because the counterfactual would be slower to introduce market arrangements and respond to technical and other developments.

- *System operator*, pro-competitive because the counterfactual would be less likely to introduce contestable contracts.

- *Other services*, pro-competitive for services such as market administration because the counterfactual would be more likely to result in in-house

supply rather than contestable contracts, and neutral for other services such as metering.

VI. Public benefits

The basis for comparison

146. This section assesses whether the proposed arrangement would be likely to confer a net public benefit relative to the counterfactual. Since by assumption the counterfactual begins with rules similar to the factual (at least as they pertain to the daily operations of markets), the assessment of public benefits is based on the relative quality of decision-making going forward. These effects are likely to be anticipated by the industry and hence affect current as well as future decisions. The basic premise is that the institutional structure most conducive to correct decisions will best facilitate the efficient functioning of the electricity industry and thereby create the maximum public benefit.

147. Similar to the previous section, the assessment can be made in terms of the propensity to make the following two types of decision errors:

(a) Failure to adopt a rule or take an action that would be welfare-improving.

(b) Adoption of a welfare-reducing rule or action.

148. The objective is to compare the institutional structures in terms of propensities for these errors to occur. The assessment is applied to each major element of the decision process:

- Specifying appropriate rules and levels of the variables in question.
- Monitoring or measuring compliance with what has been specified.
- Enforcing (or assuring compliance with) what has been specified.

In each case the potential for errors is assessed by reference to the information, incentives, and constraints on decision-making under the proposed arrangement and the counterfactual.

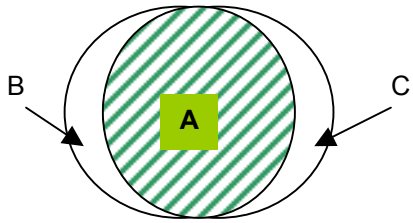
149. Given the nature of the industry (capital intensive with long-life assets) consistency of decision-making and credible commitments around key variables are important considerations.

150. The section is divided into two main parts. The first is a qualitative assessment that considers the potential for decision errors based on information, incentives, and constraints in specifying, monitoring, and enforcing rules. The second part is a quantitative assessment of the capital costs of higher-risk premia and the potential allocation, production, and dynamic efficiencies (where relevant) in the relevant markets.

Qualitative Assessment

Specification

151. The specification of rules under the proposed arrangement and the counterfactual is represented by the diagram contained in Section III:



In this diagram:

- Region A is the set of rules shared by both the factual and counterfactual. The rules are not necessarily identical, but they would cover the same aspects.
- Region B is the set of rules in the proposed arrangement that would not be part of the counterfactual.
- Region C is the set of rules in the counterfactual that would not be part of the proposed arrangement.

Potential public benefits are analysed for each region of the diagram.

(a) Common rules (Region A)

152. This section refers to the areas of the rules common to both the proposed arrangement and the counterfactual (region A of the diagram above). The proposed arrangement confers a public benefit if the institutional structure created by the contract is more efficient than the Crown EGB at specifying the rules in Region A (i.e. the common region). This is assessed by comparing the following elements:

- Information brought to bear on decisions.
- Incentives of the decision-makers.
- Constraints on decision-makers.

Information

153. Rules can best enhance welfare by facilitating, to the maximum extent possible, efficient transactions between participants (including consumers) in the electricity industry. This includes joint transactions where participants collectively purchase services from a supplier.

154. The relevant information resides with the parties who conduct transactions in the industry. In this regard, the proposed arrangement provides for the

members to each part of the rules to make the substantive decisions, not the Industry EGB. In contrast, under the counterfactual the Crown EGB and the Minister are decision makers. They face the difficulty of being one or more steps removed from the operations of the industry. The Crown EGB and the Minister inevitably would be at a disadvantage relative to industry participants in terms of the accuracy and detail of information they possess and in terms of capability to foresee the likely consequences of their decisions.

Incentives

155. The proposed arrangement allocates decision rights on a chapter-by-chapter basis to the parties involved in relevant transactions. This approach means that decision rights would be allocated to the parties most directly affected by the rules. These parties have incentives to focus resources on those elements for which the benefits of improving the specification outweigh the costs, which should lead to appropriate allocation of resources on rule development.

156. Relative to the contracting parties, the Crown EGB and future Ministers have weak incentives with regard to allocating resources for rule development. If neither party bears the costs of the rule-making process, too much resources may be devoted to areas of little economic benefit to the industry.

157. Rule changes that would improve efficiency may also have a distributive impact. The private contracting approach should resolve these tensions in an efficiency enhancing manner through at least three routes:

- Vertically integrated entities (on both sides of the transaction) internalise the distribution effect and therefore are likely to support proposed rule changes for efficiency rather than distributive reasons.

- Sufficient voting strength can usually be achieved through bargaining between the 'winners' and the 'losers' so that the latter are compensated sufficiently to justify their support to the extent needed. Such changes are economically efficient because they result in gains while leaving all parties at least as well off as prior to the change.

- A variation of the second - a package of measures is combined so that net gains are available to all parties (i.e. losses in some areas are offset by gains in other areas). The current proposal is illustrative of this approach.

158. In comparison, the Crown EGB does not need to establish 'win-win' proposals. Because 'solutions' can be imposed, there would be less potential or incentives for bargains between participants to fine-tune changes so that some parties are made better off without making any other parties worse off.

159. As discussed in section V in relation to competition effects, the commitment of the Crown EGB and the Minister to efficiency objectives may not be stable. Political incentives may weigh more heavily at times, causing the Minister to raise other objectives such as encouraging the use of renewable resources, codifying service standards, and protecting employment in companies without competitive advantages, above economic efficiency.

Constraints

160. Once a Crown EGB had been established, a government that wished to promote non-economic objectives at the expense of long-term efficiency gains would be able to do so with few constraints. The principal objective of the Crown EGB is specified in the EAA as "… to ensure that electricity is generated, conveyed, and supplied to all classes of consumers in an efficient, fair, reliable, and environmentally sustainable manner" (Section 172N). This principle suffers from multiple objectives. The principle would appear too general to provide significant discriminatory power for any court action to limit the activities of the Crown EGB.

161. In these circumstances, firms would face the risk that the 'rules of the game' would be changed after specific or sunk investments had been made reducing their ability to achieve an adequate rate of return on investments.[33] The lack of effective constraint in the counterfactual against *ex post* rule changes is of particular concern due to the large specific sunk investments in the generation, transmission, and distribution segments of the electricity industry.

162. The sunk nature of a significant proportion of electricity sector investments creates an opportunity for the Crown EGB and future Ministers to adopt adverse changes in regulations and rules because re-deployment of assets by incumbent companies would incur considerable losses. With consumption of electricity being ubiquitous and the electoral cycle being short relative to the life of such investments, the incentive on the Crown EGB and future Ministers would be to place greater weight on short-term pricing, supply security and other political objectives rather than stability to underpin efficient trade and investment in the electricity industry over the long-term. The prospect of an unstable regulatory environment would result in investment in long-lived sunk assets being reduced below the optimum level, unless prices rose to compensate investors for the increased risk.

163. By comparison, the proposed arrangements include constraints on decision-making so as to limit the scope for inefficient outcomes. These constraints were discussed in our assessment of competitive impacts (section V). The guiding principles in the proposed arrangement place heavy emphasis on efficiency. The ability of the Rulings Panel and the Industry EGB to strike down proposed rule changes contrary to the guiding principles is an important constraint. Another constraint is provided by the voting process, since measures that impair efficiency will normally impact on the parties to the underlying transaction – buyers or sellers or both. In many circumstances the voting allocation should deny a majority for efficiency-reducing rules, so that the 'strike down' provisions would be required only as a backstop measure.

164. The counterfactual does not incorporate these protections. In particular, while the current GPS gives some emphasis to efficiency (amongst other

[33] Specific or sunk investments are those whose value in alternative uses is substantially below their initial investment cost.

objectives), the GPS can be changed by the government of the day. A future government could downgrade the emphasis on efficiency at any time without scrutiny by Parliament. Further, any rules made under regulation would not be subject to strike down by bodies equivalent to the Rulings Panel or the Industry EGB (they may in certain circumstances be subject to review by the Regulations Review Select Committee, but not for economic efficiency reasons).

165. A substantial body of the economics literature supports the conclusion that changes in the "rules of the game" is a major risk factor for regulated utility companies. Spiller and Volgesang (1997) found, for example, that the success in the UK of privatisation and deregulation in the telecommunications, electricity, and natural gas industries was dependent on limits to existing wide regulatory discretion. Levy and Spiller (1994) examined telecommunications regulation across a variety of countries and found that performance generally, and investment more specifically, is dependent on the degree to which unpredictable government action is restrained..[34]

Conclusion

166. The analysis suggests that even in areas of common coverage, the institutional structure created by the proposed arrangement has advantages in terms of information, incentives, and constraints on the specification of rules. On this basis, the proposed arrangement would be likely to confer a net public benefit. The second part of this section estimates the likely quantifiable public benefit.

(b) Areas specific to the factual (Region B)

167. Although we assume that the counterfactual begins with the same operational rules as the proposed arrangement, the two may diverge over time. Region B represents that the parties to the proposed arrangement may in future adopt rules that are not covered by the current proposal (and which the Crown EGB may not adopt under the counterfactual). One example could be development of a financial hedge market. Another example may be rules on local common quality applying to distribution networks or sections of the transmission grid.

168. New developments of this nature could offer public benefits. To the extent that such developments were voluntary between industry participants, these new areas would be adopted only if the parties perceived net benefits to themselves. Since the Commission retains jurisdiction as competition authority, any new developments could only come into force if they were pro-competitive or conferred a positive net public benefit.

169. The Crown EGB and the Minister would not necessarily give priority to possible new developments favoured by industry participants. While some governments may be highly attuned to facilitating industry preferences, history suggests that some future Ministers will bring non-economic considerations to bear on the Crown EGB. High-profile developments would

[34] See also Spulber (1992).

be likely to crowd-out low-profile developments that may be higher up the merit order in terms of economic payoff.

Conclusion

170. These arguments imply the proposed arrangement has potential to confer a net public benefit in terms of Region B.

(c) Areas specific to the counterfactual (Region C)

171. The converse situation is that the counterfactual may in future see the adoption of rules in areas not covered by the factual (Region C). As discussed above, the Crown EGB and the Minister may face incentives to make changes for non-economic efficiency considerations.

172. Specific concerns (lifted from the GPS) might include an emphasis on renewable resources, disclosure of generator offer prices, restrictions to ensure that hydro spill is minimised, and rules to ensure that greenhouse gases are minimised.[35] The various submissions to the post-winter review of the New Zealand electricity industry also raise political pressure for the introduction of price caps, and to shift from use of marginal losses to average losses in the price system. If implemented, these measures would reduce the efficiency of the price system.

173. In the transport market, the Crown EGB and the Minister are likely to place greater weight on reducing the risk of transmission constraints than would occur under the proposed arrangement. In particular, under the proposed arrangement the purchasers of transmission services would trade-off the benefits of less frequent constraints against the costs of relieving constraints. Under the counterfactual the Crown EGB and the Minister would trade-off reputation and political benefits of reducing constraints against the costs to the Crown EGB and Minister of compelling transmission users to pay for the investment. Similarly, in determining Transpower's pricing methodology the Crown EGB and Minister would be likely to place greater weight on transparency, ability to rationalise publicly, and lower arbitrage risks than would occur under the proposed arrangement.

Conclusion

174. Under the counterfactual, the Crown EGB could extend regulations and rules into new areas not covered by the proposed arrangement. Such extensions would have merit if they served to enhance efficient trading (and the benefits exceeded the costs of the action) but would create a 'public loss' if introduced for political reasons. The Crown EGB and the Minister are likely to face incentives to introduce changes for non-economic reasons.

Monitoring

175. The effectiveness of a set of rules depends on the extent of compliance by participants and this in turn depends on appropriate monitoring and

[35] Page 2, Government Policy Statement on Electricity, December 2000.

enforcement. This section analyses monitoring while the following section analyses enforcement.

176. The comparison between the proposed arrangement and the counterfactual with regard to monitoring is based on the following elements:

- Availability of relevant information;
- Incentives to monitor.

Information

177. The proposed arrangement specifies in detail the information that participants and service providers would be required to report to the compliance body. By assumption, the counterfactual initially embodies the same set of operational rules and therefore the same reporting requirements. The formal reported information available to monitor compliance with the rules would be the same under the factual and counterfactual.

Incentives

178. The proposed arrangement specifies that the Industry EGB must monitor the conduct of each member and service provider. The rules state that the System Operator shall monitor compliance of asset owners with 'asset owner performance obligations' (Section III of Part C). Monitoring of participants for other aspects of the rules would be carried out by a compliance body that reports directly to the Chairs of the Rulings Panel and the Industry EGB. This would ensure independence of the compliance body of all industry participants and service providers.

179. The counterfactual is assumed to adopt the same compliance bodies as specified in the proposed arrangement. On this basis, we conclude that the proposed arrangement would be neutral in terms of public benefits.

Enforcement

180. The scope of transactions covered by the proposed arrangement is extensive and often highly complex. Any enforcement regime for the electricity industry must rely to a large extent on self-compliance but also be backed up by an effective enforcement regime. Particularly with respect to operations affecting the grid, any failure to achieve high levels of compliance would result in significant risk of a major system failure.

181. The comparison of enforcement between the proposed arrangement and the counterfactual considers both compliance and enforcement incentives:

- Incentives on participants to comply with the rules.
- Incentives on enforcing bodies to enforce the rules.

Incentives for compliance

182. Most industry participants recognise their inter-dependence in maintaining quality, security, and integrity of the rules. Ultimately, all participants suffer from increased uncertainty if high levels of compliance are not achieved consistently over time. Nevertheless, the competitive environment in the wholesale and retail markets creates incentives for parties to reduce costs through non-compliance.

183. Under the proposed arrangement, the parties set the required standards of performance and also agree to enforcement methods and processes for dispute resolution. The factual has the important feature that the participants remain involved so that they would mutually agree alterations to the standards and sanctions in response to changes in the environment. This would help to ensure that the standards and sanctions remain relevant and should ensure higher levels of commitment and 'buy-in' to compliance than might be the case otherwise.

184. Under the counterfactual, the Crown EGB could establish a working group to obtain industry input on standards and sanctions. However, the working group would be advisory, so that the Crown EGB or Minister may not accept its recommendations. Also, with limited resources, the Crown EGB would tend to focus on meeting the annual performance targets, which may give low priority to enforcement issues until problems become significant and visible. Proposed changes to regulations or rules to effect desired improvements would also compete with other issues for the Minister's attention and approval.

185. Extended delays in making appropriate changes would be detrimental to incentives for compliance. Each deliberate breach of the rules tends to undermine commitment by competitors and can quickly lead to the rules falling into general disrespect.

Incentives for enforcing rules

186. The proposed arrangement specifies in Guiding Principle 9 that the rules should be robust and enforceable by a judicial body that is neutral, independent, and has sufficient authority to monitor and enforce the rules. The rules provide for the Industry EGB to appoint the Rulings Panel, with each participant submitting to its jurisdiction. The rules also provide for mediation and arbitration processes with the aim of resolving most disputes before they reach the Rulings Panel.

187. Under the counterfactual, it is assumed the Crown EGB would recommend similar enforcement processes to the Minister.[36] On this basis, we assess that the incentives of the enforcing bodies would be substantially the same in the factual and counterfactual.

[36] The EAA provides for regulations that "[provide] for compliance with electricity governance regulations and rules to be monitored and enforced by Crown EGB or any other person or court …" (Section 172F(k)).

Contestable service provider contracts

188. Under the proposed arrangement the system operator and other service functions are contestable contracts, whereas this may not be the case under the counterfactual.

189. The choice between contestable and non-contestable forms of contracting is important in the context of both the proposed arrangement and counterfactual. The situation is most unlike a standard-form company where shareholders have a common interest to maximise value by offering value in competitive markets. Instead, in both the proposed arrangement and the counterfactual the users of services will have very limited exit options and capital market and corporate control pressures will be absent.

190. Ensuring that all service functions are provided through contestable contracts offers one of the few mechanisms available to promote efficiency:

- Greater pressure to minimise operational costs.
- Greater pressure to provide high quality services, including keeping to a minimum the compliance cost imposed on the members.
- Greater pressure to innovate so as to achieve greater value and lower overall costs.

191. Indirect evidence that contestable contracting creates value is provided by increasing use of the mechanism to provide market services (e.g. the Nordic Power Pool, the New Electricity Trading Arrangements in the UK, and the NSW gas market).

192. On this basis, we conclude that the proposed arrangement offers a public benefit in relation to contracting of system operator and other services such as market administration.

Quantitative Assessment

193. This section establishes two frameworks for quantifying the level of public benefits. The first framework considers regulatory risk and the cost of corporate financing. The second framework assesses potential allocation, production, and dynamic efficiency gains in the relevant markets arising from specific differences that may emerge between the proposed arrangements and the counterfactual.

194. We illustrate these frameworks by applying indicative numbers to create scenarios that are suggestive of the potential magnitude of public benefit under the proposed arrangement. Given the limited information available on a number of the key parameters the estimates produced are necessarily highly uncertain. Nevertheless, the analysis does highlight the areas where efficiency gains and losses are likely to be most significant.

195. The following describes the nature of the efficiencies and presents the key results. A discount rate of 10 percent is used for all Net Present Value (NPV)

calculations. Details of all equations, assumptions and numerical calculations are provided in Annex II.

General assessment concerning regulatory risk

196. The qualitative analysis has highlighted the lack of protective constraints under the counterfactual and the associated commitment problem the government faces. Hence, we conclude that the regulatory risk is substantively higher under the counterfactual than the proposed arrangements.

197. Quantifying the effect of the regulatory risk necessitates controlling for changes in investor perceptions that are unrelated to the regulatory environment. The United States, with different regulatory regimes applying in each State, allows a comparison between regulatory regimes at a point in time (i.e., while holding the global environment constant).

198. Our LECG colleagues in the US, working with Pablo Spiller, obtained a report by Regulatory Research Associates that ranks the regulatory regimes in each state from the point of view of an investor in the State's utility. The report has 9 possible ratings for state regulatory regimes with the best being called "above average" and the worst being called "below average". Data was also obtained showing the Moody bond ratings for each investor-owned utility in each state. A regression analysis conducted by professor Spiller showed that States with less risky regulatory regimes tend to have utilities with a lower cost of debt, as indicated by their Moody bond rating. For each two levels of improvement in a State rating, there is on average, a one level improvement in the Moody rating.

199. These results suggest that an adverse regulatory regime that reduces bond ratings by one level (e.g. from A1 to A2 or from Baa1 to Baa2 on Moody's scale) might increase the cost of debt by about 10 basis points.[37] A fall in ratings across scales (e.g. from A3 to Baa1) might increase the cost of debt by 25 basis points. Given the influence of the US in world capital markets, these results might reasonably be used as a proxy for utility investor perceptions of regulatory risk[38].

200. In the following scenario we apply this analysis to the New Zealand electricity industry. We extend the analysis to focus on the weighted-average cost of capital (WACC) rather than only the cost of debt. Using WACC recognises that different regulatory regimes also impact on the cost of equity. In general, equity values would be more sensitive than debt to adverse regulatory actions (because debt holders would typically rank before equity holders). Hence, in most circumstances these estimates provide a lower bound estimate for the impact of regulatory risk on the WACC. Table 4 below reports two estimates of the potential increase in the cost of capital for the

[37] 100 basis points is an increase of one percentage point.

[38] The change in the spreads is not linear, with a change in rating of a low-risk investment (Say Aa1 to Aa2) resulting in a smaller change in basis points compared with a change in one level of a high-risk investment (say B3 to Caa). The spreads may also differ between countries and over time.

generation/retail, transmission, and distribution sectors. The first estimate assumes that regulatory risk under the counterfactual increases the cost of capital by 10 basis points while the second assumes an increase of 25 basis points. On this basis, the potential gain in Net Present Value (NPV) terms under the proposed arrangement would be between $95 – $240 million.[39]

Table 4: Potential impact of regulatory risk on cost of capital

	Asset value ($b)	*Annual cost at: 10 b.p. ($m)*	*25 b.p. ($m)*
Generation & retail	9.2	9.2	23.0
Transmission	2.1	2.1	5.3
Distribution	4.2	4.2	10.5
Total	15.5	15.5	38.7
NPV gain under the proposal		**95**	**238**

Assessments for the relevant markets

201. This section assesses the possible public benefits by conducting a 'market by market' analysis of issues raised in the qualitative analysis. The markets covered are the electricity market, transport market, and the system operator and market services (administration, pricing, and clearing services). We have not constructed scenarios for the other markets (such as ancillary services, reconciliation and metering) because of greater uncertainty regarding information and potential impacts of the proposed arrangement relative to the counterfactual. We are not aware of any aspects to those markets that would change the conclusions to our analysis.[40]

(a) Electricity market

202. The qualitative analysis above argues that the proposed arrangement is less likely than the counterfactual to see rules develop that may harm competition and efficiency. Relevant issues for quantitative analysis include:

- Competitive pressures
- Transactions cost
- Non-economic objectives

[39] For companies that are publicly owned (such as transmission and some generators) the results indicate how the counterfactual would affect the market value of those companies in the event that the government decided to sell them.

[40] The quantitative analysis also does not estimate the effects of price fixing under the Quantum Meruit regime as specified in the proposed arrangement. There are two reasons for not doing so. First, the counterfactual would impose its own form of price fixing through compulsory levies that apply to all relevant parties. Second, the Quantum Meruit regime is subject to appeal through the courts and thus can be struck down in particular cases if deemed inappropriate. As the court may refine any Quantum Meruit charge to reflect the specific circumstances of the case, this approach is likely to give rise to public benefits relative to average charges imposed by the Crown EGB.

- Price caps
- Disclosure of offer prices

Competitive pressures

203. Paragraphs 118 – 123] discuss the potential for actions under the counterfactual that could raise entry barriers and inhibit full use of the dispensation provisions in the rules. The weaker competitive pressure that may result under the counterfactual would confer losses on the economy in terms of allocation, production, and dynamic efficiency. We model the effects of weaker competition as follows:

- Higher prices in the electricity market than under the proposed arrangement. Prices are assumed to increase slowly to 5% higher by year 10 (implying that prices are higher on average by 2.8%)

- Slightly less pressure to minimise costs, amounting to 1% higher costs by year 10 (implying higher costs on average of 0.6%)

- Less incentive and less scope to innovate, resulting in lower productivity growth (0.95% per annum under the counterfactual versus 1.00% p.a. under the proposed arrangement).

204. Under this scenario, the proposed arrangement has a NPV gain relative to the counterfactual of around $150 million (see Table 5). Production and dynamic efficiencies are the dominant sources of gain.

Table 5: Competition in the electricity market

	Value	*Units*
Allocation efficiency		
Average price increase with weaker competition	2.8	%
Average annual dead weight loss (DWL)	2.5	$m/ yr
NPV of allocation effic. gain under proposal	12	$m
Production efficiency		
Average efficiency loss with weaker competition	0.6	%
Average annual value loss	9.9	$m/ yr
NPV of production effic. gain under proposal	52	$m
Dynamic efficiency		
Difference in productivity growth rate	0.05	%
Average value loss years 1-10	5.2	$m/ yr
NPV of dynamic effic. gain under proposal	89	$m
NPV of efficiency gains under proposal	**154**	**$m**

Transactions cost

205. The cost of trading in the electricity market will be affected by the quality of rules specified. We model a scenario where trading fees and compliance costs begin at the same level, but increase progressively to 10% higher in the counterfactual relative to the proposed arrangement. The average value loss amounts to $3.3 million per annum, with NPV of $17.4 million (see Table 6).

Table 6: Transactions cost in electricity market

	Value	*Units*
Annual transactions cost under proposal	60.0	$m/ yr
Average efficiency loss under counterfactual	5.5	%
Annual value loss under counterfactual	3.3	$m/ yr
NPV of production efficiencies	**17.4**	**$m**

Non-economic objectives

206. The pursuit of non-economic objectives such as promotion of wind, solar and other renewable generation resources could be implemented in various ways (e.g. providing for favourable ranking in dispatch). We apply a probabilistic approach to model the potential for implementation of some as yet unspecified rule changes to achieve non-economic objectives. We assign a probability of 50% that rules are altered to reflect non-economic objectives under the counterfactual and zero probability under the proposed arrangement.[41]

207. We construct a scenario where implicit subsidies result in non-economic generators achieving a market share of 5% over ten years (an average of 2.8%). The cost disadvantage of non-economic generators is assumed to range between 0 – 20%, with an average of 10%.

208. The scenario implies production efficiency losses averaging $4 million per year. Taking into account the probability of non-economic objectives being implemented, the expected NPV gain under the proposed arrangement amounts to $12 million (see Table 7).

[41] In part, this assignment for the counterfactual reflects the emphasis on greenhouse gases in the GPS and the special reporting role assigned to the Parliamentary Commissioner for the Environment in the EAA. While the same reporting role also would also apply to proposed arrangement, our assessment is that the Crown EGB is likely to be influenced more by a negative report from the PCE than would the members of the proposed arrangement.

Table 7: Non-economic objectives in electricity market		
	Value	*Units*
Average market share of subsidised generators	2.8	%
Average cost disadvantage	10	%
Total cost of non-economic objectives	4.4	$m/ yr
NPV of production efficiency loss	23.6	$m
Probability of non-econ. objectives under proposal	-	%
Probability of non-econ. obj. under the counterfactual	50	%
Expected NPV gain under proposal	12	**$m**

Price cap

209. A price cap would specify a maximum clearing price for the wholesale spot market. The imposition of a price cap would have three main effects:

- *Market power*: A price cap would reduce the scope for the exercise market power by generators. The exercise of market power results in an allocation inefficiency due to output being less than the competitive level;
- *Quantity rationing:* A price cap increases the risk of load shedding (quantity rationing) in circumstances where a higher price would elicit greater supply or reduce demand;
- *Investment incentives:* A price cap reduces the incentive for investment in generation, transmission, and demand management technology that would increase supply capacity or reduce the cost of demand reductions during periods of high prices. This creates a dynamic inefficiency where the risk of load shedding increases cumulatively relative to a situation of no price cap.

210. As with the previous model, we adopt a probabilistic approach. Probabilities are assigned in three areas:

- Probability that a price cap is introduced under the proposed arrangement and counterfactual
- Probability that the market is strongly or weakly competitive, with the latter being subject to exercise of market power
- Probability of dry years occurring where market clearing prices would increase above the price cap.

211. The scenario for modelling market power and quantity rationing effects is constructed with the following additional assumptions:[42]

- In the case of a weakly competitive market, that the exercise of market power results in prices being marked up by 100% (during dry years);

[42] The scenario does not incorporate dynamic effects resulting from adverse impacts on investment incentives.

- A price cap of $250/MWh, being 5 times higher than the average wholesale price of around $50/MWh

- Quantity rationing through load shedding occurs when the competitive market price would (if unconstrained) rise above the price cap due to water or other input shortages[43]

- The cost of non-supply to end users is around $12,000/MWh (based on a study reported in Annex II).

212. The model is applied to half-hourly data for February – October 2001, covering the supply shortages over the recent winter. In this sample, the price cap of $250/MWh binds in around 5% of trading periods.

213. Table 8 lists values for the assumptions noted above and the key results. The scenario shows that the use of a price cap to prevent the exercise of market power results in only modest gains in allocation efficiency, around $1.1 million in a dry year (such as in 2001). The loss from quantity rationing is much larger, potentially in the order of several hundred million dollars. Taking account that dry years occur infrequently, and the probability that the price cap is imposed under the proposed arrangement and counterfactual, the expected NPV gain under the proposal amounts to around $24 million.

Table 8: Price cap in the electricity market

	Value	*Units*
Key assumptions		
Price cap	250	$/ MWh
Cost of non-supply	12,000	$/ MWh
Mark up on marginal cost in weak market	100	%
Probability of weakly competitive market	50	%
Probability of strongly competitive market	50	%
Probability of dry year	2	%
Probability of price cap under proposal	10	%
Probability of price cap under counterfactual	50	%
Key results		
Price cap prevents exercise of market power		
- Expected efficiency gain in dry year	1.1	$m/ yr
Price cap leads to quantity rationing		
- Expected efficiency loss in dry year	491	$m/ yr
Expected NPV gain under proposal	24	**$m**

[43] This assumption is too strong as the intervention of price caps could cause generators to operate off their supply curve when the cap is binding. The assumption made will tend to bias the scenario against price caps.

Disclosure of offer prices

214. The disclosure of offer prices could have two effects on efficiency:

- *Tacit collusion:* Disclosure of generator offer prices increases the risk of tacit collusion, resulting in the loss of allocation efficiency through the exercise of market power by generators; and

- *De facto price cap:* The disclosure of offer prices may force generators to keep offer prices below market clearing levels as they seek to avoid negative public and political reaction with the possibility of being branded as charging extortionate prices.

215. The potential for tacit collusion depends on three factors:

- The ability of parties to use the rule as a coordination device[44]
- Whether market power is already being exercised since in this case the coordination device is not required
- Whether the market price is below the *de facto* price cap level.

216. For the *de facto* price cap we adopt the scenario developed above for an explicit price cap. A key difference between this scenario and the explicit price cap is the assignment of probabilities for disclosure of offer prices and also the addition of a probability that disclosure leads to tacit collusion and a *de facto* price cap.

217. Table 9 lists the assumed probabilities and the expected NPV gain under the proposed arrangement. In this scenario, the net gain amounts to $24 million.

Table 9: Disclosure of offer prices in the electricity market

	Value	*Units*
Proability market was weakly competitive	50	%
Probability market was strongly competitive	50	%
Probability that disclosure leads to tacit collusion	50	%
Probability disclosure leads to de facto price cap	50	%
Probability of disclosure under proposal	25	%
Probability of disclosure under counterfactual	100	%
Expected NPV gain under proposal	**24**	**$m**

[44] The extent of any time delay before release of the information may be a relevant factor.

(b) Transport

218. This section models the potential public benefits of the proposed arrangement in the transport market. The main focus is on the benefits of enhanced competitive pressures through transparent and collective processes for determining transmission investment.

219. A scenario is constructed to model the potential gain in production efficiency by assuming that enhanced competitive pressures increase the efficiency of both operations and investment:

- Operating efficiency under the proposed arrangement is assumed to improve progressively up to a maximum of 10 percent by year 5 (relative to counterfactual)
- Investment efficiency is assumed to improve by 1% in all years.

220. The scenario for dynamic efficiency is modelled analogously to that for the electricity market. Given the concentrated market structure in transmission, the gap between productivity growth rates under the proposed arrangement and counterfactual is wider than that assumed for the electricity market: we assign a gap of 0.10 percentage points in transmission compared for 0.05 percentage points in the electricity market.

221. The scenarios assume that enhanced competition could be introduced under the counterfactual but that this is less likely than under the proposed arrangement. We assign a probability of only 25% under the counterfactual.

222. On the basis of these assumptions, Table 10 reports an expected NPV gain of $85 million under the proposed arrangement.

Table 10: Competition for transmission services

	Values	*Units*
Production efficiency		
Increased efficiency on operations	8	%
Increased efficiency on investment	1	%
Average gain on operations & investment	12	$m/ yr
NPV of production efficiency gain	69	$m
Dynamic efficiency		
Productivity gain with competition	1.00	%
Productivity gain without competition	0.90	%
NPV of dynamic efficiency gain	43	$m
Probability of competition under proposal	100	%
Probability of competition under counterfactual	25	%
Expected NPV of production & dynamic efficiency gains under the proposal	**85**	**$m**

(c) System operator and market services

223. The proposed arrangement has greater probability than the counterfactual of enhancing competitive pressures through the use of contestable contracts for system operator and market services. The scenarios for production and dynamic efficiencies are analogous to those developed above.

224. For market services, it is assumed that the proposed arrangement ensures the contract is contestable with 100% probability while the counterfactual has only 50% probability of maintaining contestability.

225. For system operator services, we assign probabilities of 75% and 25% that the contract would become fully contestable under the proposed arrangement and counterfactual respectively.

226. Table 11 reports the key assumptions and results for both markets. The scenarios produce NPV gains under the proposed arrangement of around $8 million for system operation services and $3 million for market services.

Table 11: Contestability for system operator & market services

	System Operator	*Market services*	*Units*
Production efficiency			
Average efficiency gain	8	8	%
Average annual value gain	2.1	0.8	$m/ yr
NPV of production efficiency gain	11.8	4.3	$m
Dynamic efficiency			
Productivity growth with contestability	1.00	1.00	%
Productivity growth without contestability	0.90	0.90	%
NPV of dynamic efficiency gain	4.0	1.2	$m
Probability of contestability under proposal	75	100	%
Probability of contestability under counterfactual	25	50	%
Expected NPV of efficiency gains under proposal	**8**	**3**	**$m**

Summary of quantitative analysis

227. Table 12 summarises the results of the scenario analyses conducted in this section. Both the general assessment based on the 'cost of capital' analysis and the 'market by market' analyses suggest potential for the proposed arrangement to confer a public benefit of several hundred million dollars relative to the counterfactual.

228. We emphasise that the scenarios conducted are rudimentary and are subject to high levels of uncertainty. We have assigned probabilities to particular events occurring under the counterfactual and also values to other parameters. In most cases reasonable people could differ on the appropriate values to assign.

229. Nevertheless, on the basis of our framework, different assignments would alter the magnitude of benefits under the proposed arrangement but would not turn the net positive into a net negative.

Table 12: Summary of expected NPVs under the proposed arrangement

	Allocation efficiency ($m)	*Production efficiency ($m)*	*Dynamic efficiency ($m)*	*Total*
Electricity market				
Enhanced competition	12	52	89	154
Transactions cost	-	17	-	17
Non-economic objectives	-	12	-	12
Price cap	24	-	-	24
Disclosure of offer prices	24	-	-	24
Subtotal	60	81	89	231
Transport market				
Enhanced competition	-	52	33	85
Service markets				
Contestable system operator services	-	6	2	8
Contestable market services	-	2	1	3
NPV of public benefits from market analysis	**60**	**142**	**124**	**326**
NPV of public benefits based on cost of capital (Table 4)				**95 - 238**

Conclusions on public benefits

230. The proposed arrangement confers a net public benefit relative to the counterfactual for the following reasons:

- The parties to the proposed arrangement would have better information and incentives than the Crown EGB and Minister to specify rules so as to facilitate the efficient functioning of the electricity industry;
- The proposed arrangement incorporates a number of important constraints on decision making that are absent from the counterfactual, including the guiding principles, voting structure, and oversight by the Commerce Commission.
- The proposed arrangement would be neutral with respect to public benefits with regard to the monitoring enforcement functions.

231. Our analysis, both in general terms based on the 'cost of capital' analysis and the 'market by market' analyses, suggest potential for the proposed arrangement to confer a public benefit of several hundred million dollars relative to the counterfactual.

VII. Conclusions

232. Our overall assessment is that the proposed arrangement has a favourable impact on competition in the relevant markets as compared to the most likely counterfactual based on regulation.

233. Even though the counterfactual is assumed to adopt the operational rules specified in the proposed arrangement, our analysis finds a significant risk to competitive neutrality under the counterfactual. This risk derives from lack of constraints against regulations with anti-competitive impacts and generally weak incentives to place competition ahead of non-economic objectives.

234. In contrast, the proposed arrangement places heavy emphasis on competition in its guiding principles and provides back-up mechanisms for their achievement. Moreover, the proposed arrangement would have the advantage of remaining subject to the jurisdiction of the Commission whereas this would not be the case for regulations promulgated under the counterfactual.

235. In addition to the pro-competitive effects, the proposed arrangement would confer a positive net public benefit relative to the counterfactual. Similar to the arguments given for competition, the main benefits derive from better information, stronger incentives, and well-specified constraints on the rule-making process.

ANNEX I: THE RELEVANT MARKETS

(a) Electricity

Product markets

236. The sale and purchase of electricity occurs at wholesale and retail levels.[45] At the margin there are possibilities for substituting electricity with other forms of energy such as coal, natural gas, and oil. However, most consumers of electricity do not have existing facilities to switch from electricity to coal, gas, or oil. These facilities involve costly additional installation, or additional storage space, or both. Electricity has characteristics that make it a highly convenient form of energy for most users, so that it is the preferred choice for reasons other than price.

237. Applying the *ssnip* test, our assessment is that a single seller would profit from a small increase in price, implying that electricity is a market distinct from other forms of energy.

Functional markets

238. Transactions in electricity take place at wholesale and retail levels using both spot and hedge contracts. However, for the purposes of competition analysis these functional distinctions do not necessarily imply separate markets. Consider the following:

- Large direct purchasers have a choice between buying wholesale or from retailers. Since many generators participate in both wholesale and retail trading, a single seller in the wholesale market could not increase profits by imposing a ssnip. Buyers in the wholesale market would switch to those generators that supply to the retail market;

- Similarly, a single seller of spot contracts could not increase profits by imposing a ssnip because buyers would switch to hedge contracts and *vice versa*.

239. However, while large direct purchasers may switch from wholesale to retail markets, small retail purchasers may not make the reverse switch from retail to wholesale due to the transactions cost relative to the value of purchases. If 'small' retail purchasers in aggregate amount to sufficient volume relative to large direct purchasers, a single seller in the retail market could profit by imposing a ssnip. In the absence of sufficient information to determine this issue empirically, we leave open the possibility that retailing is a separate market from wholesaling.

[45] In the electricity industry the wholesale market is where producers of electricity sell to retailers or direct purchasers. In other industries this is often referred to as the manufacturing market.

Geographical markets

240. Electricity generators are distributed throughout the North and South Islands and are interconnected by the transmission grid. For most trading periods the grid is unconstrained, so that generators are dispatched according to the merit order determined from generators' offer prices and losses on the transmission system. For a small percentage of trading periods one or more transmission constraints are binding and this affects the merit order for dispatch of generation. For example, Transpower has reported that the Tokaanu-Whakamaru circuit was constrained for around 10% of trading periods over the past three years.[46]

241. In the majority of trading periods where the grid is unconstrained, a single seller located in any region of New Zealand would not increase profits by imposing a ssnip because buyers would switch to suppliers in other regions. Thus, the geographical market for electricity is the whole of New Zealand.

242. When transmission constraints are binding there is a limit to the amount of electricity transferred between regions. In these circumstances, a single seller in the constrained region would be the price setter and inelastic demand would enable the seller to increase profits by imposing a ssnip . Thus, in the presence of binding constraints the relevant markets for electricity are determined according to the location of the constraint.

243. As reported above, over the past three years the grid was constrained for a small proportion of trading periods. We therefore conclude that for the large majority of trading periods the electricity market is the whole of New Zealand.

Temporal markets

244. Electricity trading is conducted in half-hourly lots, amounting to 48 trading periods over each day. In economic terms, the supply of electricity at different times during the day or year can be viewed as a different product.

245. Consider the trading of electricity in two adjacent half-hour periods. Because purchasers cannot store electricity in significant quantities, the cross-elasticity of demand between adjacent half-hour periods depends on the viability of switching consumption between periods. Some businesses, such as cool store and smelter operators, can switch their consumption between periods at some cost (including the opportunity cost of lost production).

246. However, the daily profile of trough and peak prices on the spot market indicates that substitution possibilities are currently limited for the majority of consumers – otherwise arbitrage between trading periods would reduce the gap between trough and peak prices.

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[46] *Supplementary submission to the post-winter review of New Zealand electricity system,* Transpower New Zealand Limited. The submission also reported that, apart from the HVDC, the only other circuits constrained more that 1% of time over the past three years were those in and leading south from Taranaki.

247. The current limited extent of demand-side management means that a single seller in one half-hour period could increase profits by imposing a ssnip in that period. Hence, in economic terms, each half-hour trading period is a distinct market.

248. This conclusion could change in the future. Over the next five or more years the cost of technology may fall such that sufficient numbers of end users may implement demand-side management (and the length of the trading period may reduce) so as to substantially increase the cross-elasticity of demand between adjacent time periods. A reduction in the trading period from 30 to five minutes would facilitate greater demand-side participation and create greater incentive to make the necessary investments. If these developments occur then individual trading periods could cease to be distinct markets.

(b) Transport of electricity

Product markets

249. Electricity is transported over the high-voltage transmission grid to distribution nodes (grid exit points), where it is 'stepped down' to a lower voltage and distributed to residential and commercial users.

250. The potential substitutes for transport of electricity are:

- locating generation close to demand sources (e.g. building a generation station near Auckland),
- locating major users close to supply (e.g. locating a smelter near the hydro lakes)
- demand-side management to reduce peak flows.

251. However, substitution possibilities are marginal in the sense that most opportunities are limited to capacity expansions. Over any reasonable period of analysis the revenue impact of a *ssnip* over existing capacity would outweigh the potential revenue losses from loss of rights to expand capacity. Therefore, a single seller of electricity transport services could increase profits by imposing a ssnip.

Functional markets

252. Transmission and distribution are distinct functions that emphasise different capabilities. Relative to transmission, distribution requires different skills in managing a matrix network of connections and large numbers of customer relationships.

253. However, some consumers are connected directly to the transmission grid, and some distribution companies do operate local high-voltage lines. This suggests that, at least for large loads, the functional difference between transmission and distribution does not *per se* cause them to be in economically distinct markets. As discussed below, the ability to profit from a ssnip relates to locational characteristics.

Geographical markets

254. Transmission and distribution are defined geographically by the nodes that interconnect with generators, distributors, and end consumers. Areas where lines or networks overlap or are equidistant from customers could potentially compete in the same geographical market. Therefore, the geographical divisions are not definitive and will vary in each situation.

255. However, our assessment is that a single seller in an area would profit by imposing a ssnip, notwithstanding that there will be exceptions for the reasons noted above.

Temporal markets

256. Electricity transport services have temporal markets in the same way that electricity does (as described above). For given demand and supply profiles for electricity, and therefore derived demand for transport services, the substitution elasticity of demand between adjacent time periods is very low – transport is needed instantaneously at the time that electricity is consumed.

(c) Ancillary services

Product markets

257. The main ancillary services are instantaneous reserve, frequency control reserves, over-frequency arming, voltage support, load shedding, and black start.[47] These services are supplied for the purpose of maintaining the frequency and voltage on the transmission grid within specified ranges. Each service plays a distinct role in maintaining the quality of electricity in a manner that would suggest very low cross-elasticity of demand between the ancillary services. Hence, the ssnip test implies that each ancillary service is a separate service market within the system of other ancillary services.

258. A further issue is whether the ancillary services are in the same market as energy. System security requirements, which mandate that enough reserve be carried to cover the largest contingency, place a lower bound on the demand for reserves for a given level of electricity supply and system configuration. A change in the level of generation, the locations of supply, or

[47] *Instantaneous reserve* is extra generation capacity and energy or equivalent load reduction that is made available within a few seconds of a sudden failure of a generating or transmission facility. *Frequency control reserves* are required to maintain frequency on the grid at about 50 Hz under varying conditions. It is provided by one or more generating stations operating in a partly-loaded mode so it can increase or decrease its output to maintain the frequency within limits. *Over-frequency arming*: If the HVDC link trips when substantial energy is being sent to the North Island, the frequency in the South Island rises very quickly before the over-speed protection of the generators is able to respond. To prevent this, some generators have relays fitted to trip them prior to reaching excessive frequencies so normal frequency is restored swiftly. *Voltage support* enables voltages on the grid to be maintained within certain limits. *Load shedding* is the disconnection of load to prevent a cascade failure of the grid. *Black-start capability* enables the power system to recover from a total shutdown. Some power stations are fitted with a capability that allows them to self-start and to energise the grid in the vicinity so that, ultimately, full supply can be restored over the whole grid.

change in grid configuration changes the demand for ancillary services (except load shedding and black start). Changes in electricity prices are one cause of such changes.

259. However, the reverse does not apply. A change in the price of instantaneous reserve (or other ancillary services) has insignificant impact on the demand for electricity (or transport services). For example, in Decision 369 the Commission accepted that the price of instantaneous reserves had moved quite differently from electricity prices and had had no discernable impact on the demand for electricity. This is consistent with the fact that, in value terms, ancillary services are a very small input to the electricity market (in the order of $50 million p.a., while electricity trades amount to around $1.8 billion p.a.). Even a very large percentage change in ancillary service prices would have only a tiny impact on electricity prices.

260. In conclusion, the ssnip test implies that each ancillary service is a separate service market.

Geographical markets

261. As energy and frequency are common across the entire grid, most ancillary services are New Zealand-wide. The exceptions are over-frequency arming and voltage support.

262. Over-frequency arming is a South Island market because it is the risk of failure in the inter-island HVDC link that gives rise to its demand. If the HVDC link trips off (with power flowing northward across the link), a portion of the South Island generators need to trip off quickly to reduce supply back to demand levels in the South Island.

263. Voltage support has geographical markets because, in contrast to real power (electrical energy), reactive power (voltage) dissipates with distance.

Temporal markets

264. Ancillary services are supplied in real time in the same way as electricity. They therefore have temporal markets.

(d) System operator services

Product markets

265. The system operator service arises from the need to maintain a balance between injection and off-take of energy from the grid. If an imbalance in demand and supply persists, the frequency (or voltage) on the grid deviates from normal levels and ultimately can damage the generators and other assets connected to the grid. The system operator instructs energy suppliers and ancillary services to increase or reduce supply to maintain quality.

266. With no substitute services available, a single seller would profit by imposing a ssnip. System coordination is therefore a service market that is separate from other markets.

Functional markets

267. In addition to the grid, each local network also requires a system operator. However, the service performed by the network coordinators is not substitutable for grid-level coordination or between networks. Hence, a single seller to the grid or to any particular network could profit by imposing a ssnip and each is therefore a separate functional market. Further, the proposed arrangement does not cover the network coordination services, so that the relevant markets include only the grid-level system operator.

Temporal markets

268. System coordination must respond in real time to events as they occur. Therefore, as with electricity, the system coordination markets have a strong temporal dimension.

(e) Administration, Pricing and Clearing services

Product markets

269. Buyers and sellers of electricity (and ancillary services) may lower transaction costs by utilising intermediary services to facilitate search, price discovery, and settlement. This applies particularly to generators, retailers, and large consumers.

270. Currently, participants can avoid or reduce their utilisation of market services in two ways: through direct bilateral contracting between parties and through vertical integration. The large participants in the wholesale market maintain their own trading teams to engage in bilateral contracting. The four largest generation companies are also vertically integrated in retailing. However, no individual company nor any two trading parties can ensure matching demand and supply – there remains a need for balancing transactions between all parties. This feature of electricity markets implies that a single seller of each market service (administration, pricing, clearing) would profit from a snipp.

(f) Registry services

Product markets

271. The registry service records the identification numbers of end-users' meters and matching records that identify the retailer servicing each end-user. Retailers use the service when they sign up new consumers to identify their characteristics and change 'ownership' of the consumer so that correct records feed into the reconciliation process.

272. Prior to introducing the registry in 1999 the transaction costs of switching end-users meant that only fairly large consumers with time-of-use meters could switch suppliers. The registry service substantially reduces the transaction costs. These factors suggest that a single seller of retail market services could profitably impose a ssnip. Hence, registry services is a separate services market.

(g) Meter services

Product markets

273. Meter services involve installation, maintenance, and periodic reading of meters. Meter services are essential for providing the basic quantity information to the reconciliation process that determines the final quantities of electricity purchased and sold by generators, retailers, and end users. As an essential service for measuring traded quantities, a single seller of meter services could profit from a ssnip. Meter services are a separate service market.

Functional, geographical, and temporal markets

274. Meter services have no functional, geographical or temporal distinctions of note.

(h) Reconciliation services

Product markets

275. Reconciliation services involve processing estimated quantities from meters to determine and allocate losses on the grid and local networks. The reconciled quantities are inputs to the Scheduing, Pricing & Dispatch (SPD) model to determine half-hour spot prices and in clearing and settlement processes. Apart from fixed-fee contracts, all wholesale energy trades and most transport-related charges require the input of reconciled quantities in the settlement process.

276. A single seller of reconciliation services could profit from a ssnip, implying that reconciliation is a separate services market.

Functional markets

277. The requirement for full allocation of electricity injections can be applied separately to each grid and each local network. A reconciliation service can be specified for the national transmission grid and separate services for each local network (which may or may not overlap geographically). Reconciled quantities produced for one local network are irrelevant to parties in another network. Similarly, apart from the point of interconnection of network to the grid, reconciled quantities within local networks are irrelevant to reconciled quantities over the grid. Thus, separate reconciliation services are possible, and a single seller to the grid or each local network would profit by imposing a ssnip. Hence, the grid and each local network represent separate functional markets.

ANNEX II: QUANTITATIVE MODELS AND SCENARIOS

This Annex provides detail on the quantitative models and scenarios constructed to illustrate the possible magnitude of public benefits and detriments discussed in Section VI of the Report.

In most cases, scenarios are constructed for 10-year periods to reflect the progressive divergence between the proposed arrangement and counterfactual. The models do not incorporate the effects of economic growth and inflation.

The NPV for each scenario is calculated over 10 years, except in the case of dynamic efficiency where the horizon is extended to 30 years to better account for the effects of cumulative growth effects. The discount rate used throughout is 10% per annum.

Regulatory risk and cost of capital

Assumptions and data

The scenario assumes that regulatory risk causes a one-level change in bond rating, and that the required return on equity is affected by the same amount as the required return on bonds.

Asset values for the major participants were obtained as follows:

- Generator and retailer companies: 2001 Annual Reports for Meridian Energy Limited, Mighty River Power Limited, Genesis Power Limited, and Infratil Limited (for Trustpower). Asset value for Contact Energy was obtained from an independent valuation by Grant Samuel Limtied, dated May 2001
- Transmission: Transpower Annual Report, 2001
- Distribution: ODV estimates from the Final Report of the Ministerial Inquiry into the Electricity Industry.

Calculation method

Annual value loss from higher cost of capital under the counterfactual was calculated as:

Loss ($m) = Asset value ($b) x basis points change in WACC / 10.

Electricity market

Competitive pressures

Enhanced competitive pressures under the proposed arrangement relative to the counterfactual lead to allocation, production, and dynamic efficiency gains.

Assumptions and data

Energy trading is around $1.8 billion annually. Volume of production is around 36,750 GWh, implying an average price of about $50 per MWh.

The long-run price elasticity of demand is set at the median (-1.2) of eleven U.S.-based studies reported in Maloney and McCormack (1996). The long-run supply elasticity is set at 0.5 on an *ad hoc* basis without reference to previous studies.

Weaker competitive pressures under the counterfactual are assumed to have the following effects:

- Production efficiency falling behind the efficient frontier, with inefficiency rising linearly to 1% by year 10
- Prices rising slowly relative to the proposed arrangement, amounting to 5% by year 10 (implying 4% increase after allowing for production inefficiency)
- Slower growth in productivity, falling from 1.00% per annum to 0.95% per annum.

Calculation method for allocation efficiency

(1) Demand elasticity (definition)

$$E_d = \frac{Q_0 - Q_1}{Q_1} \frac{P_1}{P_0 - P_1}$$

Where Q_0 and P_0 are quantity and price under the proposed arrangement (36,750 GWh and $50/MWh) and Q_1 and P_1 are prices under the counterfactual.

(2) Supply elasticity (definition)

$$E_s = \frac{Q_0 - Q_1}{Q_1} \frac{MC_1}{P_0 - MC_1},$$

where MC_1 is the marginal opportunity cost at Q_1.

(3) Price P_1 under weak competition (counterfactual)

$P_1 = P_0(1+\mu)$, where μ is the percentage mark up (5% by year 10)

(4) Quantity demanded at price P_1

$$Q_1 = \left\{1 + E_d\left(\frac{P_1}{P_0} - 1\right)\right\} Q_0$$

(5) Marginal cost at quantity Q_1

$$MC_1 = \left\{1 + \frac{1}{E_s}\left(\frac{Q_1}{Q_0} - 1\right)\right\} P_0$$

(6) Dead weight loss

$$DWL = \frac{1}{2}(P_1 - P_0)(Q_0 - Q_1)$$

Calculation method for production efficiency

(7) Production efficiency loss

Loss=Value of energy output under proposal

x Efficiency losses under weaker competition

Calculation method for dynamic efficiency

(8) Productivity gain (compounded)

$$\text{Productivity gain} = (1+\rho)^n - 1,$$

where ρ is the productivity growth rate (1.00% in proposed arrangement and 0.95% in counterfactual), and n is number of years.

(9) Difference in productivity level

Difference=Productivity gain with low barriers & impediments—

Productivity gain with higher barriers & impediments

(10) Dynamic efficiency gain in year *t*

Efficiency gain=Difference in productivity level

x Value of electricity output under proposal

Results

Calculations and results are presented in Tables A1 – A3.

Transactions cost

Assumptions and data

It is assumed that under the counterfactual decision-making with poorer information and incentives and weaker constraints leads to progressively higher cost of administering and complying with the rules. The scenario assumes that transactions cost increases linearly to 10% above the proposed arrangement by year 10.

NZEM's annual operating costs are around $20m. The compliance cost of market participants is assumed to be double the NZEM costs, so that total transaction costs amount to $60m per annum.

Calculation method

(11) Total transactions cost

Total transactions cost=NZEM costs + In-house compliance costs

(12) Production efficiency loss

Loss=Total transactions cost x Additional transactions cost (%)

Results

Calculations and results are presented in Table A4.

Non-economic objectives

Assumptions and data

It is assumed that the rules of the market are altered to confer an advantage on renewable resource generation (e.g. wind, solar), distributed generation, and demand-side management. The scenario assumptions include:

- An implicit subsidy that results in the market share of non-economic plant (and demand-side reduction) increasing progressively to 5% by year 10
- Probability of 50% that such distortions are introduced under the counterfactual (zero under proposal)
- The cost disadvantage of non-economic plant is assumed to range between 0 to 20%, with mid point of 10%

Calculation method

(13) Quantity of non-economic generation

Quantity=total market generation x market share of subsidised generation

(14) Additional cost per MWh

Cost per MWh=Average electricity price

x average cost disadvantage (%) of subsidised generators

(15) Total cost of non-economic objectives

Total cost=Quantity produced by non-economic plant

x Cost per MWh

Results

Calculations and results are presented in Table A5.

Price cap

The potential impact of a price cap on efficiency is assessed based on data over the recent winter when supply shortages lead to high prices for a sustained period. The analysis allows for a probability that market power was exercised during the period and on this basis estimates the gain in allocation efficiency from reducing or eliminating the price and quantity effects of market power. The analysis also allows

that in some periods the competitive market price may exceed the price cap, leading to the potential for quantity rationing. The analysis estimates the resulting loss in allocation efficiency. Dynamic efficiency losses are not modelled.

Assumptions and data

Data on half-hourly clearing prices at Benmore, Haywards, and Otahuhu from 1 February – 31 October 2001 was supplied by M-co. Key statistics are summarised in Table A6. Given the broad similarity of prices across nodes, the Haywards (HAY) prices were selected for all calculations.

Quantity data for NZEM was aggregated across all grid exit points for each half-hour. The data was factored up by 25% to reflect that NZEM accounts for around 75% of total energy traded.

Table A6: Summary statistics for prices and quantities

	Clearing Prices			*Aggregate*
	Benmore	*Haywards*	*Otahuhu*	*Quantity*
	$/ MWh	$/ MWh	$/ MWh	MWh
Maximum	976	989	983	4,806
Median	61	63	64	2,219
Minimum	5	5	5	1,205
Number of observations	13,104	13,104	13,104	13,104

The price cap is set as 5 times the average price of $50/MWh in a 'normal' year, amounting to $250 per MWh. The observed price exceeds this cap in 4.8% of trading periods during February – October.

The exercise of market power is assumed to result in prices being set as a mark up above the marginal opportunity cost at the observed quantity level. For illustrative purposes the percentage mark up was assumed to be 100%.

The average cost of non-supply (CNS) under quantity rationing is the loss of consumer surplus or production by the average end-user. The MACQS Frequency Standards Working Group (FSWG) reported to the GSC in August 2001 on overseas studies.[48] The report assessed the average CNS for New Zealand to be in the range $7.5 - $17 per KWh, with a mid point of $12 per KWh ($12000 per MWh).

Short-run demand and supply elasticities were set on an *ad hoc* basis at –0.05 and 0.05, respectively (implying a 20% price change results in 1% demand and supply changes in periods where demand is near peak in dry years).

Other assumptions are:

- Probability of 50% that the electricity market is weakly competitive during dry years, providing scope for the exercise of market power
- Probability of 50% that the electricity market is strongly competitive during dry years

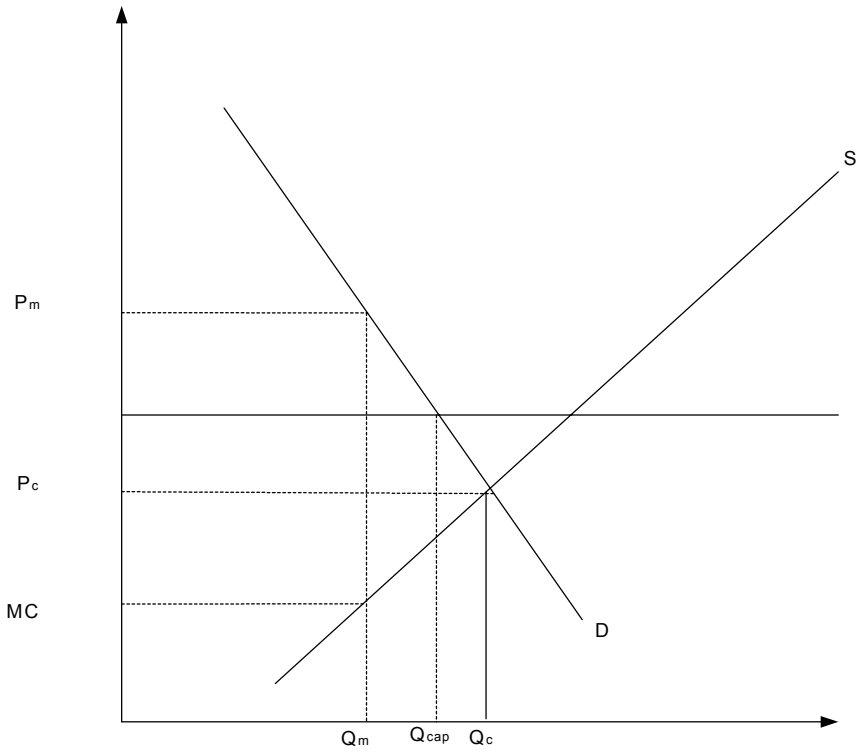
[48] See http://www.gsp.co.nz/library/gsc_aug2001/appendix/appendix6_solution.doc

- Probability of 2% of dry year (1 year in 50)
- Probability of 10% that price cap (at $250/MWh) is introduced under the proposed arrangement
- Probability of 50% that price cap (at $250/MWh) is introduced under the counterfactual.

Calculation of deadweight loss in dry year under weakly competitive market with no price cap

The calculation method is based on the hypothesis that market power did exist and was exercised during the data period. On this basis, the observed prices and quantities represent the outcome with market power, denoted P_m and Q_m in Figure A1.

FIGURE A1: PRICE CAP IN ELECTRICITY MARKET



Calculations are as follows:

(16) Marginal cost at observed quantity

$$MC = \frac{P_m}{1+\mu}, \text{ where } \mu \text{ is the percentage mark-up}$$

(17) Competitive market equilibrium price:

$$P_c = \frac{P_m MC\left(E_s - E_d\right)}{E_s P_m - E_d MC}$$

(18) Competitive market equilibrium quantity

$$Q_c = \left\{1 + E_d\left(\frac{P_c}{P_m} - 1\right)\right\} Q_m$$

(19) Dead weight loss with no price cap

$$DWL_{mp} = \frac{1}{2}\left(P_m - MC\right)\left(Q_c - Q_m\right)$$

Calculation of dead weight loss in dry year under weakly competitive market with price cap

Figure A1 illustrates that a price cap may reduce price below the market clearing level (P_m) but does not necessarily reduce prices to the competitive price level (P_c). In these circumstances, the price cap reduces but does not eliminate the deadweight loss (DWL) arising from the exercise of market power. The residual DWL is calculated as follows:

(20) Quantity demanded at price cap

$$Q_{cap} = \left\{1 + E_d\left(\frac{P_{cap}}{P_m} - 1\right)\right\}Q_m$$

(21) Marginal cost at quantity demanded at price cap

$$MC_{cap} = \left\{1 + \frac{1}{E_s}\left(\frac{Q_{cap}}{Q_m} - 1\right)\right\}MC$$

(22) Dead weight loss with price cap

$$DWL_{cap} = \begin{cases} 0, \text{ if } P_{cap} < P_c \\ \frac{1}{2}\left(P_{cap} - MC_{cap}\right)\left(Q_c - Q_{cap}\right), \text{ if } P_c < P_{cap} < P_m \\ DWL_{mp}, \text{ if } P_m < P_{cap} \end{cases}$$

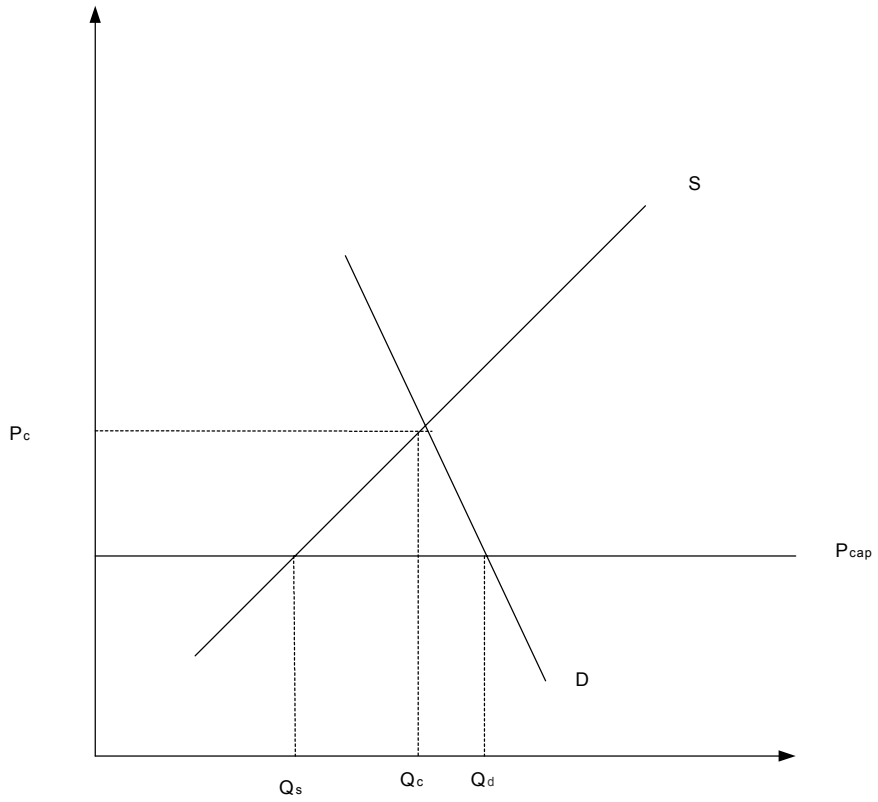
(23) Allocation efficiency gain in dry year

Gain=DWL with no price cap − DWL with price cap

Calculation of quantity rationing in dry year under weakly competitive market with price cap

Whenever the competitive market equilibrium price rises above the price cap the excess demand must be rationed to end-users. In Figure A2 the rationed quantity is $Q_d - Q_s$.

FIGURE 2: QUANTITY RATIONING WITH PRICE CAP



Formulae are calculated as follows:

(24) Supply quantity offered at price cap

$$Q_s = \left\{1 + E_s\left(\frac{P_c}{P_{cap}} - 1\right)\right\}^{-1} Q_c$$

(25) Quantity demanded at price cap

$$Q_d = \left\{1 + E_d\left(\frac{P_{cap}}{P_c} - 1\right)\right\} Q_c$$

(26) Loss of consumer surplus

$$\text{Loss} = CNS(Q_d - Q_s) - \frac{1}{2}(P_c + P_{cap})(Q_d - Q_c)$$

(27) Saving on production cost

$$\text{Cost saving} = \frac{1}{2}(P_c - P_{cap})(Q_c - Q_s) + (Q_c - Q_s)P_{cap}$$

(28) Allocation efficiency loss

DWL=Loss of consumer surplus—Cost saving

Calculations for quantity rationing during dry year in strongly competitive market

The calculations in this part are based on the hypothesis that the market was competitive and that market power was not exercised during the data period. On this basis, the observed prices and quantities represent the competitive equilibrium rather than the market power equilibrium (as assumed in 1.4.2 – 1.4.4).

The calculation methods for quantity rationing are the same as in 1.4.4. The value loss from rationing is higher because the competitive price (set equal to observed price) is higher than in section 1.4.4 where competitive price was lower than the observed price. The price cap is therefore binding more frequently and causes larger disparity between demand and supply.

Calculation of expected values

(29) Expected value loss in dry year

Loss=Probability of weakly competitive market x (Allocation efficiency loss from rationing under weak competition – Allocation efficiency gain from reducing exercise of market power)

+Probability of strongly competitive market x Allocation efficiency loss from rationing under strong competition

(30) Expected annual value loss

Loss=Probability of dry year x Expected value loss in dry year

(31) Expected NPV gain under proposal

Gain=NPV of losses above x (Probability of price cap under counterfactual – Probability of price cap under proposal)

Results

Detailed calculations on 13104 observations for 1 February – 31 October 2001 are available on spreadsheet by request. A summary of calculations and results is presented in Table A7. Calculations of annualised and NPV gains under the proposal are presented in Table A8.

Disclosure of offer prices

Assumptions and data

Price and quantity data are the same as that described in Section 1.4 of this Annex. Key assumptions are:

- The market could be either weakly or strongly competitive, with the same probabilities as assumed in Section 1.4

- If the market is weakly competitive then generators would exercise market power in the absence of disclosure, so that disclosure does not result in significantly higher mark up of prices (i.e. no new tacit collusion)

- If the market is strongly competitive then disclosure results in tacit collusion with probability 50%

- If tacit collusion occurs the average mark up on the competitive price is 10%

- Irrespective of whether the market is weakly or strongly competitive, disclosure results in a *de facto* price cap with probability 50%

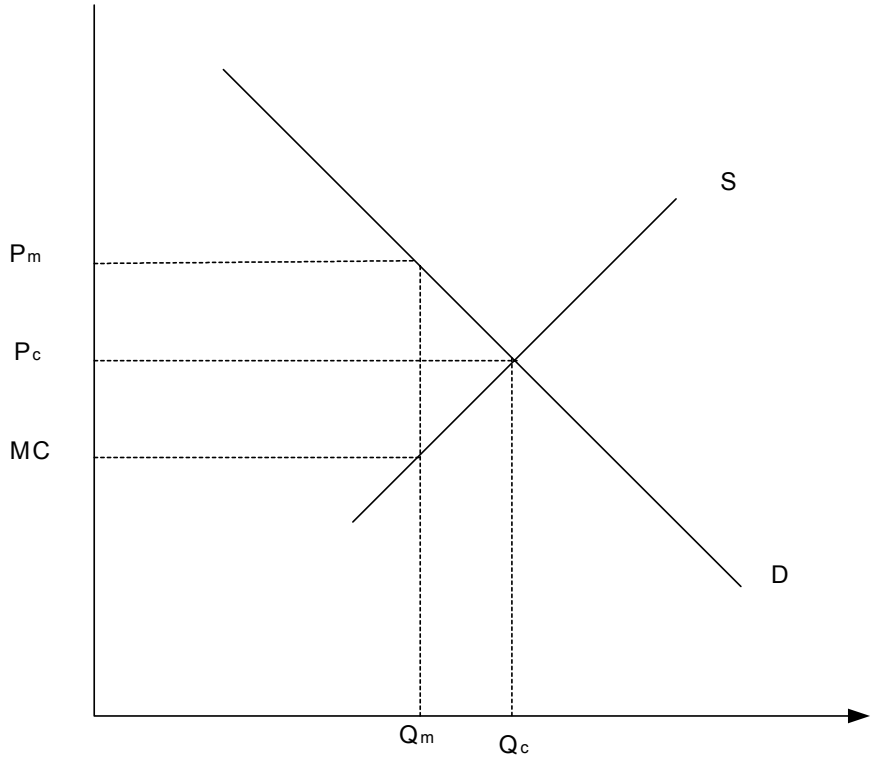
- The *de facto* price cap is the same level as assumed in section 1.4

- The probabilities of disclosure under the proposal and counterfactual are 25%and 100% respectively.

Calculation method for tacit collusion in market that was strongly competitive

The calculation method for tacit collusion is based on the hypothesis that observed NZEM prices and quantities during 2001 (with no disclosure requirement). This is illustrated in Figure A3, where P_c and Q_c are the observed "competitive" prices and quantities and P_m and Q_m are the prices and quantities with disclosure of offer prices (i.e. tacit collusion).

FIGURE A3: TACIT COLLUSION



New equations are as follows:

(32) Market price with disclosure

$$P_m = (1+\mu)P_c$$

where μ is the mark-up due to tacit collusion

(33) Market quantity with disclosure

$$Q_m = \left\{1 + E_d\left(\frac{P_m}{P_c} - 1\right)\right\}Q_c$$

(34) Marginal cost at output Q_{md}

$$MC = \left\{1 + \frac{1}{E_s}\left(\frac{Q_m}{Q_c} - 1\right)\right\}P_c$$

(35) Allocation efficiency loss when market was strongly competitive

$$DWL = 0.5(P_m - MC)(Q_c - Q_m)$$

(36) Expected annual value loss

Loss=DWL x Probability market was strongly competitive

x Probability that disclosure leads to tacit collusion

Calculation method for *de facto* price cap in both weak and strongly competitive market

(37) Expected NPV of efficiency losses

Loss=NPV of allocation efficiency losses under price cap (Section 1.4.6)
x Probability disclosure leads to de facto price cap

Results

Calculations and results are presented in Table A9.

Transport market

Competitive pressures

Enhanced competitive pressures under the proposed arrangement relative to the counterfactual lead to allocation, production, and dynamic efficiency gains. The following models production and dynamic efficiencies but not allocation efficiency.

Assumptions and data

Relevant data from Transpower New Zealand Limited *Annual Report* (2001) are:

- Total operating revenue of around $500m per annum, with transmission service fees of $440m
- Operating expenses (less depreciation and other non-cash charges) of around $160m
- Depreciation charge on fixed assets of $90m, implying average replacement investment of around this amount.

Increased competitive pressure is assumed to result in the following efficiency gains:

- Operating efficiency improves linearly to 10% above counterfactual by year 5
- Efficiency of investment improves by 1% above the counterfactual, beginning year 1
- Higher growth in productivity, increasing from 0.90% per annum to 1.00% per annum.

Calculation method for production efficiency

(38) Operating efficiency gains under competition

Gain=Annual transmission fees x Operating costs as percent of total operating revenue x Operating efficiency gains under competition (%)

(39) Investment efficiency gains under competition

Gain=Annual transmission investments (including replacement) x
Investment efficiency gain under competition (%)

(40) Expected NPV of production efficiency gain

Expected total gain=NPV of operating & investment efficiency gains

x (Probability of competition under proposal –
Probability of competition under counterfactual)

Calculation method for dynamic efficiency

Calculation method is the same as for Section 1.1.4.

Results

Calculations and results are presented in Tables A10 – A11.

Service provider markets

Competitive pressures

Models are constructed for assessing the value gains from greater competitive pressures in market administration services and system operator services. Potential production and dynamic efficiencies are calculated analogously to Section 2 of this Annex.

Assumptions and data

Total fees for wholesale market services in Transpower New Zealand Limited *Annual Report* (2001) amount to around $40m. For market administration services, M-co fees have amounted to around $10m per annum. Additional tasks relating to addition of transport governance and other arrangements could take the cost of market administration to around $12m per annum.

For both market and system operator services it is assumed that weaker competitive pressures under the counterfactual result in production efficiency losses rising linearly to 10% by year 5. In both markets, productivity growth rates under the proposal and counterfactual are assumed to be 1.00% and 0.90% respectively.

Calculation method for production and dynamic efficiencies

Calculation methods are analogous to Sections 2.1.2 – 2.1.3.

Results

Calculations and results are presented in Tables A12 – A15.

TABLES

Table A1: Competition in the electricity market - allocation efficiency												*Ave. &*
Parameters	*Units*	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*	*Year 8*	*Year 9*	*Year 10*	*Totals*
Average price under strong competition	$/ MWh	50	50	50	50	50	50	50	50	50	50	50
Average quantity under strong competition	GWh	36,750	36,750	36,750	36,750	36,750	36,750	36,750	36,750	36,750	36,750	36,750
Mark up on price under weak competition	%	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5	2.8
Price elasticity of demand (long-run)	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.2
Price elasticity of supply (long-run)		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.5
Average quantity under weak competition	GWh	36,530	36,309	36,089	35,868	35,648	35,427	35,207	34,986	34,766	34,545	35,537
Marginal cost at new quantity	$/ MWh	49.4	48.8	48.2	47.6	47.0	46.4	45.8	45.2	44.6	44.0	46.7
DWL from higher price under weaker competition	$m/ yr	0.1	0.3	0.6	1.1	1.7	2.4	3.2	4.2	5.4	6.6	2.5
Discount rate	%											10%
NPV of allocation effic. gain under proposal	**$m**											**12**

Table A2: Competition in the electricity market - production efficiency												*Ave. &*
Parameters	*Units*	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*	*Year 8*	*Year 9*	*Year 10*	*Totals*
Value of electricity output under proposal	$m/ yr	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
Efficiency losses under weaker competition	%	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1	0.6
Value losses under weaker competition	$m/ yr	1.8	3.6	5.4	7.2	9.0	10.8	12.6	14.4	16.2	18.0	10
Discount rate	%											10%
NPV of production effic. gain under proposal	**$m**											**52**

Table A3: Competition in electricity market - dynamic efficiency												*Ave. &*
Parameters	*Units*											Totals
Years 1 - 10		*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	
Productivity gain with low barriers & impediments	%	1.00	2.01	3.03	4.06	5.10	6.15	7.21	8.29	9.37	10.46	5.67
Productivity gain with higer barriers & impediments	%	0.95	1.91	2.88	3.85	4.84	5.84	6.84	7.86	8.88	9.92	5.38
Difference in productivity level	%	0.05	0.10	0.15	0.21	0.26	0.31	0.37	0.43	0.49	0.55	0.29
Value of electricity output under proposal	$m/ yr	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
Dynamic efficiency gain under proposal	$m	0.9	1.8	2.8	3.7	4.7	5.7	6.7	7.7	8.8	9.8	5.2
Years 11 - 20	Year	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	
Productivity gain with low barriers & impediments	%	11.6	12.7	13.8	14.9	16.1	17.3	18.4	19.6	20.8	22.0	
Productivity gain with higer barriers & impediments	%	11.0	12.0	13.1	14.2	15.2	16.3	17.4	18.6	19.7	20.8	
Difference in productivity level	%	0.6	0.7	0.7	0.8	0.9	0.9	1.0	1.1	1.1	1.2	
Value of electricity output under proposal	$m/ yr	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	
Dynamic efficiency gain under proposal	$m	10.9	12.0	13.1	14.3	15.5	16.7	17.9	19.1	20.4	21.6	
Years 21 - 30	Year	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	
Productivity gain with low barriers & impediments	%	23.2	24.5	25.7	27.0	28.2	29.5	30.8	32.1	33.5	34.8	
Productivity gain with higer barriers & impediments	%	22.0	23.1	24.3	25.5	26.7	27.9	29.1	30.3	31.5	32.8	
Difference in productivity level	%	1.3	1.3	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	
Value of electricity output under proposal	$m/ yr	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	
Dynamic efficiency gain under proposal	$m	22.9	24.3	25.6	27.0	28.4	29.8	31.3	32.7	34.2	35.8	
Discount rate	%											10%
NPV of dynamic effic. gain under proposal	**$m**											**89**

Table A4: Transactions cost in the electricity market												*Ave. &*
Parameters	*Units*	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*	*Year 8*	*Year 9*	*Year 10*	*Totals*
NZEM costs	$m/ yr	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
Traders' compliance costs	$m/ yr	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	-
Total transactions cost	$m/ yr	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	**60.0**
Additional transactions costs under counterfactual	%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	**5.5%**
Production efficiency loss under counterfactual	$m/ yr	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	**3.3**
Discount rate	%											**10%**
NPV of production efficiency loss	**$m**											**17.4**

Table A5: Non-economic objectives in the electricity market												*Ave. &*
Parameters	*Units*	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*	*Year 8*	*Year 9*	*Year 10*	*Totals*
Total generation output	GWh/ yr	36,750	36,750	36,750	36,750	36,750	30,000	30,000	30,000	30,000	30,000	33,375
Market share of 'subsidised' generators	%	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.0	2.8
Quantity of non-economic generation	GWh/ yr	184	368	551	735	919	900	1,050	1,200	1,350	1,500	875.6
												-
Electricity prices	$/ MWh	50	50	50	50	50	50	50	50	50	50	50
Cost disadvantage	%	10	10	10	10	10	10	10	10	10	10	10
Additional cost per MWh	$/ MWh	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Total cost of non-economic objectives	$m/ yr	0.92	1.84	2.76	3.68	4.59	4.50	5.25	6.00	6.75	7.50	4.4
Discount rate	%	10	10	10	10	10	10	10	10	10	10	10%
NPV of production efficiency loss	$m											23.6
												-
Probability of non-econ. objectives under proposal	%											-
Probability of non-econ. obj. under the counterfactual	%											50%
Expected NPV of production efficiency loss	**$m**											12

Table A7: Price cap in a 'dry year' (2001) in the electricity market			
		Value	*Units*
Global assumptions			
Elasticity of demand (short-run)	-	0.05	
Elasticity of supply (short-run)		0.05	
Price cap		250	$/ MWh
Cost of non-supply		12,000	$/ MWh
Weakly competitive market			
Mark up on marginal cost		100	%
Price cap prevents exercise of market power			
DWL with no price cap		12.5	$m/ yr
DWL with price cap		10.4	$m/ yr
Allocation efficiency gain		2.1	$m/ yr
Price cap leads to quantity rationing			
Loss of consumer surplus		247.9	$m/ yr
Saving on production costs		4.5	$m/ yr
Allocation efficiency loss		243.5	$m/ yr
Net efficiency loss under weak competition		241	$m/ yr
Strongly competitive market			
Price cap leads to quantity rationing			
Loss of consumer surplus		755	$m/ yr
Saving on production costs		16.5	$m/ yr
Net efficiency loss under strong competition		739	$m/ yr
Expected values			
Probability of weakly competitive market		50	%
Probability of strongly competitive market		50	%
Expected value loss in a dry year		**490**	**$m/ yr**

Table A8: Price cap in the electricity market in all years		
	Value	*Units*
Value loss in dry year with price cap (Table A7)	490	$m/ yr
Probability of dry year	2	%
Expected annual value loss	9.8	$m/ yr
Discount rate	10	%
NPV of allocation efficiency losses	60	$m
Dynamic efficiency		
Reduced investment increases extent of rationing	-	
NPV of allocation and dynamic efficiencies	60	$m
Probability of price cap under proposal	10	%
Probability of price cap under counterfactual	50	%
Expected NPV gain under proposal	**24**	**$m**

Table A9: Disclosure of offer prices in the electricity market		
	Value	*Units*
Tacit collusion		
Mark up on competitive prices	10	%
Allocation efficiency loss under weak competition	-	$m/ yr
Allocation efficiency loss under strong competition	0.9	$m/ yr
Proability market was weakly competitive	50	%
Probability market was strongly competitive	50	%
Probability that disclosure leads to tacit collusion	50	%
Expected annual value loss	0.2	$m/ yr
Discount rate	10	%
NPV of value losses	1.5	$m
de facto price cap		
NPV of allocation efficiency losses (Table A8)	60	$m
Probability disclosure leads to de facto price cap	50	%
Expected NPV of efficiency losses	30	$m
Net efficiency loss from collusion and price cap	32	$m
Probability of disclosure under proposal	25	%
Probability of disclosure under counterfactual	100	%
Expected NPV gain under proposal	**24**	**$m**

Table A10: Competition for transmission services - production efficiencies												*Ave.*
Parameters	*Units*	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*	*Year 8*	*Year 9*	*Year 10*	*& Totals*
Operating cost:												
Current annual transmission costs	$m/ yr	440	440	440	440	440	440	440	440	440	440	440
Operating costs as percent of total costs	%	32	32	32	32	32	32	32	32	32	32	32
Operating efficiencies under competition	%	2	4	6	8	10	10	10	10	10	10	8
Reduction in operating costs	$m/ yr	3	6	8	11	14	14	14	14	14	14	11
Investment:												
Annual investments (incl. replacement)	$m/ yr	100	100	100	100	100	100	100	100	100	100	100
Investment efficiency gain under competition	%	1	1	1	1	1	1	1	1	1	1	1
Reduction in capital expenditure	$m/ yr	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total efficiency gain on operating cost & investments	$m/ yr	3.8	6.6	9.4	12.3	15.1	15.1	15.1	15.1	15.1	15.1	12
Discount rate	%											10%
NPV of production efficiency gain	$m											69
Probability of competition under proposal	%											100%
Probability of competition under counterfactual	%											25%
Expected NPV of production efficiency gain	**$m**											**52.0**

Table A11: Competition for transmission services - dynamic efficiencies												*Ave.*
Parameters	*Units*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	& totals
Years 1 - 10												
Productivity gain with competition	%	1.00	2.01	3.03	4.06	5.10	6.15	7.21	8.29	9.37	10.46	
Productivity gain without competition	%	0.90	1.81	2.72	3.65	4.58	5.52	6.47	7.43	8.40	9.37	
Difference in productivity level	%	0.10	0.20	0.31	0.41	0.52	0.63	0.74	0.85	0.97	1.09	
Current annual transmission costs	$m/ yr	440	440	440	440	440	440	440	440	440	440	
Dynamic efficiency gain	$m	0.4	0.9	1.3	1.8	2.3	2.8	3.3	3.8	4.3	4.8	
Years 11 - 20	Year	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	
Productivity gain with competition	%	11.6	12.7	13.8	14.9	16.1	17.3	18.4	19.6	20.8	22.0	
Productivity gain without competition	%	10.4	11.4	12.4	13.4	14.4	15.4	16.5	17.5	18.6	19.6	
Difference in productivity level	%	1.2	1.3	1.5	1.6	1.7	1.8	2.0	2.1	2.3	2.4	
Current annual transmission costs	$m/ yr	440	440	440	440	440	440	440	440	440	440	
Dynamic efficiency gain	$m	5.3	5.9	6.4	7.0	7.5	8.1	8.7	9.3	9.9	10.5	
Years 21 - 30	Year	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	
Productivity gain with competition	%	23.2	24.5	25.7	27.0	28.2	29.5	30.8	32.1	33.5	34.8	
Productivity gain without competition	%	20.7	21.8	22.9	24.0	25.1	26.2	27.4	28.5	29.7	30.8	
Difference in productivity level	%	2.5	2.7	2.8	3.0	3.1	3.3	3.5	3.6	3.8	3.9	
Current annual transmission costs	$m/ yr	440	440	440	440	440	440	440	440	440	440	
Dynamic efficiency gain	$m	11.2	11.8	12.5	13.1	13.8	14.5	15.2	15.9	16.6	17.4	
Discount rate	%											10%
NPV of dynamic efficiency gain	$m											43.5
Probability of competition under proposal	%											100%
Probability of competition under counterfactual	%											25%
Expected NPV of production efficiency gain	**$m**											**32.6**

Table A12: Contestable contracts for market services - production efficiencies												*Ave.*
Parameters	*Units*	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*	*Year 8*	*Year 9*	*Year 10*	*& totals*
Operating cost:												
Annual cost of service with contestability	$m/ yr	12	12	12	12	12	12	12	12	12	12	12
Operating costs as percent of total costs	%	80	80	80	80	80	80	80	80	80	80	80
Additional operating cost without contestability	%	2	4	6	8	10	10	10	10	10	10	8
Efficiency losses	$m/ yr	0.2	0.4	0.6	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1
Discount rate	%											10%
NPV of production efficiency gain	$m											4.3
Probability of contestability under proposal	%											100
Probability of contestability under counterfactual	%											50
Expected NPV of production efficiency gain	**$m/ yr**											**2.2**

Table A13: Contestable contracts for market services - dynamic efficiencies												*Averages*
Parameters	*Units*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	& totals
Years 1 - 10												
Productivity gain with contestability	%	1.00	2.01	3.03	4.06	5.10	6.15	7.21	8.29	9.37	10.46	
Productivity gain without contestability	%	0.90	1.81	2.72	3.65	4.58	5.52	6.47	7.43	8.40	9.37	
Difference in productivity level	%	0.10	0.20	0.31	0.41	0.52	0.63	0.74	0.85	0.97	1.09	
Annual cost of service with contestability	$m/ yr	12	12	12	12	12	12	12	12	12	12	
Dynamic efficiency gain	$m	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	
Years 11 - 20	Year	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	
Productivity gain with contestability	%	11.6	12.7	13.8	14.9	16.1	17.3	18.4	19.6	20.8	22.0	
Productivity gain without contestability	%	10.4	11.4	12.4	13.4	14.4	15.4	16.5	17.5	18.6	19.6	
Difference in productivity level	%	1.2	1.3	1.5	1.6	1.7	1.8	2.0	2.1	2.3	2.4	
Annual cost of service with contestability	$m/ yr	12	12	12	12	12	12	12	12	12	12	
Dynamic efficiency gain	$m	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	
Years 21 - 30	Year	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	
Productivity gain with contestability	%	23.2	24.5	25.7	27.0	28.2	29.5	30.8	32.1	33.5	34.8	
Productivity gain without contestability	%	20.7	21.8	22.9	24.0	25.1	26.2	27.4	28.5	29.7	30.8	
Difference in productivity level	%	2.5	2.7	2.8	3.0	3.1	3.3	3.5	3.6	3.8	3.9	
Annual cost of service with contestability	$m/ yr	12	12	12	12	12	12	12	12	12	12	
Dynamic efficiency gain	$m	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	
Discount rate	%											10%
NPV of dynamic efficiency gain	$m											1.2
Probability of contestability under proposal	%											100
Probability of contestability under counterfactual	%											50
Expected NPV of dynamic efficiency gain	**$m**											**0.6**

Table A14: Contestable contracts for system operator services - production efficiencies												*Ave.*
Parameters	*Units*	*Year 1*	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*	*Year 8*	*Year 9*	*Year 10*	*& totals*
Operating cost:												
Annual cost of service without contestability	$m/ yr	40	40	40	40	40	40	40	40	40	40	40
Operating costs as percent of total costs	%	66	66	66	66	66	66	66	66	66	66	66
Reduced operating cost with contestability	%	2	4	6	8	10	10	10	10	10	10	8
Efficiency gains	$m/ yr	0.5	1.1	1.6	2.1	2.6	2.6	2.6	2.6	2.6	2.6	2
Discount rate	%											10%
NPV of production efficiency gain	$m											11.8
Probability of contestability under proposal	%											75
Probability of contestability under counterfactual	%											25
Expected NPV of production efficiency gain	**$m/ yr**											**5.9**

Table A15: Contestable contracts for system operator services - dynamic efficiencies												*Ave.*
Parameters	*Units*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	& totals
Years 1 - 10												
Productivity gain with contestability	%	1.00	2.01	3.03	4.06	5.10	6.15	7.21	8.29	9.37	10.46	
Productivity gain without contestability	%	0.90	1.81	2.72	3.65	4.58	5.52	6.47	7.43	8.40	9.37	
Difference in productivity level	%	0.10	0.20	0.31	0.41	0.52	0.63	0.74	0.85	0.97	1.09	
Annual cost of service without contestability	$m/ yr	40	40	40	40	40	40	40	40	40	40	
Dynamic efficiency gain	$m	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.4	0.4	
Years 11 - 20	Year	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	
Productivity gain with contestability	%	11.6	12.7	13.8	14.9	16.1	17.3	18.4	19.6	20.8	22.0	
Productivity gain without contestability	%	10.4	11.4	12.4	13.4	14.4	15.4	16.5	17.5	18.6	19.6	
Difference in productivity level	%	1.2	1.3	1.5	1.6	1.7	1.8	2.0	2.1	2.3	2.4	
Annual cost of service without contestability	$m/ yr	40	40	40	40	40	40	40	40	40	40	
Dynamic efficiency gain	$m	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.0	
Years 21 - 30	Year	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	
Productivity gain with contestability	%	23.2	24.5	25.7	27.0	28.2	29.5	30.8	32.1	33.5	34.8	
Productivity gain without contestability	%	20.7	21.8	22.9	24.0	25.1	26.2	27.4	28.5	29.7	30.8	
Difference in productivity level	%	2.5	2.7	2.8	3.0	3.1	3.3	3.5	3.6	3.8	3.9	
Annual cost of service without contestability	$m/ yr	40	40	40	40	40	40	40	40	40	40	
Dynamic efficiency gain	$m	1.0	1.1	1.1	1.2	1.3	1.3	1.4	1.4	1.5	1.6	
Discount rate	%											10%
NPV of dynamic efficiency gain	$m											4.0
Probability of contestability under proposal	%											75
Probability of contestability under counterfactual	%											25
Expected NPV of dynamic efficiency gain	**$m**											**2.0**

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