

Industry and market monitoring: Competition

Information paper

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Executive summary

The Electricity Industry Act (2010) requires the Electricity Authority (Authority) to undertake industry and market monitoring.

Effective industry and market monitoring will help to promote competition for the long term benefit of consumers by increasing transparency about market events and by improving access to quality information.

Competition is one of the three limbs of the Authority's statutory objective. Future information papers will address industry and market monitoring in connection with the reliability and efficiency limbs of the Authority's statutory objective.

Monitoring competition in the electricity industry will play a key role in supporting development of the Electricity Industry Participation Code 2010 by giving the Authority and wider industry participants a robust evidentiary basis upon which to identify the need for Code amendments and to assess proposals.

The focus is on the competitiveness of electricity markets, rather than the conduct of any particular market participant or group of participants. Monitoring activities will cover all market segments and participants within the electricity sector.

There is some commonality of interests between the role of the Authority and the interests and responsibilities of the Commerce Commission. Both entities have an understanding to coordinate their respective roles but this does not alter the independence of each entity and requirements to fulfil their respective statutory objectives and functions.

There will also be a relationship between the Authority's monitoring function and its compliance function under the Act but the two functions will be operationally distinct.

The Authority will be using the widely-adopted "structure-conduct-performance" framework to organise its analysis of competitiveness. This will include constructing standardised metrics of competition across each dimension of the SCP framework and applying these to a range of market segments, from the wholesale market through to ancillary service markets and the retail market.

The industry and market monitoring function is being undertaken by the Market Performance team within the Authority. The team's key outputs will include:

- routine dissemination of regular statistics and reports;
- in-depth reviews and studies of particular topics; and
- maintaining market monitoring infrastructure, such as databases, and making analytical tools publicly available to improve market participants' own monitoring capacity.

Glossary of abbreviations and terms

Act	Electricity Industry Act 2010
Authority	Electricity Authority
Code	Electricity Industry Participation Code 2010
Commerce Act	Commerce Act 1986
GEM	Generation Expansion Model
vSPD	Vectorised Scheduling, Pricing and Dispatch

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1. Introduction

- 1.1.1 This paper discusses how the Electricity Authority (Authority) is conducting industry and market monitoring in relation to competition.
- 1.1.2 The Electricity Industry Act 2010 (Act) requires the Authority to undertake industry and market monitoring. This represents a new function; a function the Authority's predecessor, the Electricity Commission, did not carry out.
- 1.1.3 The Authority intends undertaking this function openly, transparently, and professionally. This will include the provision of high-quality data, analysis, information and informed commentary.
- 1.1.4 Monitoring activities will cover all aspects of the electricity sector – from generation and some of the key associated input markets; the wholesale and related ancillary and forward markets; through to system operation, transmission, distribution and retail markets.
- 1.1.5 Ultimately, this monitoring function will help the Electricity Authority to achieve its statutory objective to:
- promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers.¹
- 1.1.6 The purpose of this paper is to:
- (a) outline the economic objective behind industry and market monitoring, beyond the simple explanation that 'the Act requires it';
 - (b) outline the scope of market monitoring, including its relationship to other Electricity Authority functions and to the competition monitoring functions of the Commerce Commission;
 - (c) describe the broader economic framework within which the Authority's monitoring role is to be implemented and carried out; and
 - (d) describe how the Authority is organising and undertaking its monitoring functions and provide information on outputs which can be expected.
- 1.1.7 The singular focus of this paper, on competition, is a matter of minimising page length. Future information papers will address

¹ The Authority has published a paper, which clarifies how the Authority interprets its statutory objective. See <http://www.ea.govt.nz/document/12803/download/about-us/documents-publications/foundation-documents/>.

industry and market monitoring in connection with the reliability and efficiency limbs of the Authority's statutory objective.

2. Purpose

- 2.1.1 The over-arching purpose of industry and market monitoring is the promotion of the Electricity Authority's statutory objective and in the context of competition this means promoting competition in the electricity industry for the long term benefit of consumers.
- 2.1.2 There is a more direct purpose, which is to fulfil a legislated requirement, i.e. the Act prescribes it, but this is subsidiary to the broader statutory objective.²

2.2 Competition for long term benefit of consumers

- 2.2.1 The Electricity Authority has interpreted the competition promotion aspect of its statutory objective as:
- Exercising its [industry and market monitoring] functions in ways that facilitate or encourage increased competition in the markets for electricity and electricity-related services, taking into account long-term opportunities and incentives for efficient entry, exit, investment and innovation in those markets.³
- 2.2.2 This interpretation puts a premium on workable competition and ensuring that underlying or structural market conditions are conducive to competitive outcomes over the longer term.
- 2.2.3 The focus on facilitating and encouraging sets a threshold for competition which is workable – in the senses that that term is used in the Commerce Act. In a workably competitive market, suppliers are unable to influence prices over a sustained period without being undercut by other incumbent generators or new entrants. This introduces a focus on conditions for competition rather than achieving competition itself.
- 2.2.4 Furthermore, accounting for long term benefits to consumers through efficient firm entry, exit, investment, and innovation means trends in competition and the competitive environment matter much more than short term episodes. The Authority has spelled this out in the interpretation of its statutory objective:

² Section 16 of the Act lists the functions of the Authority. In particular, section 16(1)(g) of the Act requires the Authority: "to undertake industry and market monitoring, and carry out and make publicly available reviews, studies, and inquiries into any matter relating to the electricity industry". Section 16(1)(f) sets out the requirements relating to market facilitation measures: "to undertake market-facilitation measures (such as providing education, guidelines, information, and model arrangements), and to monitor the operation and effectiveness of market facilitation measures."

³ Electricity Authority (2011) "Interpretation of the Authority's statutory object", February 2011, paragraph A.30.

... competition is not necessarily orderly or constant over time. There can be periods when competition declines as competitors exit markets as they discover they are unable to operate profitably, and this can happen in a disorderly manner. There can also be situations when competition appears weak because firms can charge prices above competitive levels until new suppliers enter the market or consumers find ways to reduce demand, either temporarily or permanently. The competitive process is characterised by innovative firms entering the market and eventually driving out incumbents if they are unable to respond quickly enough to meet their customers' preferences.⁴

2.2.5 In other words, short term apparently problematic behaviours can be a function of competitive dynamics which are beneficial over the long term. Indications that one supplier or another is engaging in strategic behaviour may be as much an indication of innovation and testing the limits as of problematic behaviour.

2.2.6 A key objective of monitoring then is to look at this kind of behaviour to see if there are implications for the longer term. This is encapsulated in the interpretation of the Authority's statutory objective to consider both the strength of competition and competitive pressure:

The Authority uses the term competitive pressure because it covers a broad range of competitive circumstances, including circumstances where industry participants behave competitively because they anticipate competitor responses (or the entry of new competitors) if they do not do so. In these cases, a lack of rivalrous activity is not necessarily an indication of weak competition.⁵

2.2.7 This does not negate the importance of monitoring and uncovering problematic short run behaviours. Indeed it is only through the identification of repeatedly curious market outcomes that a picture can be formed of how the entire market is operating. The point is that promoting workable competition admits a broader view of the competitive process.

2.2.8 Delving into detail to try and understand systematic issues is characteristic of the overall monitoring framework discussed in section 4.

2.2.9 This focus on workable competition and promotion of competitive conditions does not imply an unambitious approach to promoting competition:

Even in markets where the Authority considers competition is already strong, the Authority interprets its statutory objective as requiring it to adopt proposals that would further strengthen

⁴ *ibid*, paragraph A.26.

⁵ *ibid*, paragraph A.18.

competition if such proposals have positive long-term benefits for consumers.⁶

- 2.2.10 Competition in any market is a process, not a situation. Accordingly, the monitoring function of the Authority will need to evolve and adapt in order to meet the objective of strengthening competition.

2.3 Monitoring to promote competition

- 2.3.1 The main ways in which monitoring can promote competition is by:

- (a) improving transparency and access to quality information; and
- (b) informing development of the Electricity Industry Participation Code (Code).

Transparency and access to quality information

- 2.3.2 Market monitoring can improve competition in and of itself by increasing transparency about market events and by improving access to quality information. The Electricity Authority, market participants, and ultimately consumers will benefit from open information on the state of the market and explanations and explications of unusual events.
- 2.3.3 Improving access to quality information means ensuring that all industry participants have reasonable access to meaningful and reliable market information and analysis. This means information which is: timely, relevant, credible, and useful for decision making.
- 2.3.4 Accurate and timely information can help build confidence that the market governance arrangements are engendering outcomes that contribute to the long-term benefit of consumers.
- 2.3.5 Transparency and confidence in governance arrangements can in turn assist in diminishing the politicisation, or the perception thereof, of decision making within the sector.
- 2.3.6 Further, market monitoring provides for a higher quality of information on market conditions than more straightforward market information services such as data and simple statistics.
- 2.3.7 While data and statistics are part of market monitoring and are key elements in facilitating competition and effective market performance, they leave interpretation up to the user and can impose transaction costs which fall unequally across market participants. In this regard, market monitoring can help to close

⁶ Ibid, paragraph A.29.

information gaps and promote a level and more competitive playing field in the market.

- 2.3.8 Making high quality information more widely available will also increase market transparency; a key recommendation in the 2009 Electricity Market review for improving retail competition and restraining prices. Transparency alone can be effective for discouraging participants who might otherwise engage in strategic behaviour which would reduce competition. It is also a light handed and low cost approach to promoting competition, conducive to promoting innovation in the industry.

Code development

- 2.3.9 Market monitoring promotes competition indirectly by supporting the development of the Electricity Industry Participation Code 2010.
- 2.3.10 Improving and administering the Code in accordance with subpart 3 of part 2 of the Act is a central function of the Authority. A key reason to undertake monitoring is to inform and assist the Authority's Code development and amendment activities.
- 2.3.11 The use of market monitoring in supporting Code development flows directly from improved access to information. It provides a basis upon which to:
- (a) identify areas where Code amendment may be needed to improve competition; and
 - (b) assess and prioritise Code amendment proposals.
- 2.3.12 Improved access to quality information on competition in the electricity market gives both the Authority and wider industry participants a basis upon which to identify the need for Code amendments.
- 2.3.13 Market monitoring will highlight any deficiencies with current arrangements and, if appropriate, any party can make recommendations to the Authority for Code amendments. These will be recorded on the Code amendment register. This is also an option available to anyone. The Authority can also initiate proposals to change the Code.
- 2.3.14 The Authority will prioritise the entries on the Code amendment register and advance specific projects to the annual work plan. A project will then be progressed by either the Market Design or Operations Development teams. This will result in consultation with participants and eventually a Code amendment if a proposal satisfies the Authority's Code amendment principles. Finally, ex post monitoring and analysis will often be undertaken

to assess whether the Code amendment actually produced the claimed outcomes and benefits.

- 2.3.15 On some occasions, matters raised during the course of market monitoring may also be referred to the Ministry of Economic Development; if, for example, a policy improvement is indicated.
- 2.3.16 Wide dissemination of incisive market analysis and information has the potential to increase the scope and depth of scrutiny of current arrangements and will promote regulatory innovation.
- 2.3.17 As noted in the Authority's consultation charter unpredictable and ill-founded amendments can undermine investor confidence.⁷ Similarly, a deficit of easily accessible information about the state of competition in the market will reduce predictability and undermine investor confidence.
- 2.3.18 Furthermore, improved information will support reasonable Code amendment. Code amendment principles demand a robust evidentiary basis for demonstrating potential gains from Code changes or from resolving regulatory or market failure. Amendment principle 2 requires "clearly identified efficiency gain or market or regulatory failure". Principle 3 requires quantitative assessment of the costs and benefits of a proposed amendment.⁸
- 2.3.19 The requirements of the Authority's interpretation of its statutory objective, to treat competition as a process and to further strengthen the competitive process where it would be of long term benefit to consumers, compels the Authority to explore whether it would be appropriate to amend the market rules to promote competition in line with its statutory objective.

⁷ Electricity Authority (2010) "Consultation Charter", December 2010, available at <http://www.ea.govt.nz/about-us/documents-publications/foundation-documents/>.

⁸ See paragraph 2.5 of the "Consultation Charter".

3. Scope

3.1 Industry and markets

3.1.1 The performance of the entire supply chain serving the final electricity consumer will be subject to monitoring. Specific areas to be monitored include:

- (a) the wholesale spot market;
- (b) forward markets;
- (c) instantaneous reserves markets;
- (d) other ancillary services markets;
- (e) retail market;
- (f) distribution services market; and
- (g) transmission services market.

3.2 Overlaps with the Commerce Commission

3.2.1 The Authority and Commerce Commission are independent entities with distinct roles but which share some common interests in relation to the electricity industry. This includes a shared interest in monitoring and promoting competition in the industry.

3.2.2 The Commerce Commission's role is to promote competition in markets for the long term benefit of consumers within New Zealand by ensuring compliance with the Commerce Act. This includes, inter alia, investigating conduct that may breach the restrictive trade practices and business acquisitions provisions within the Commerce Act and enforcing compliance with them.

3.2.3 The Authority's objectives are three pronged: to promote competition, reliability and efficiency in the electricity industry for the long term benefits of consumers. The main ways that the Authority pursues this statutory objective are through Code amendments and market facilitation measures and enforcing compliance with the Code.

3.2.4 In regard to monitoring competition, the Authority's focus is on the competitiveness of electricity markets, rather than the conduct of any particular market participant or group of participants.

3.2.5 On rare occasions an issue highlighted by the Authority's market monitoring function may be referred to the Commerce Commission e.g. if a situation is encountered in which a market

participant is suspected of taking advantage of a substantial degree of market power to prevent competitive conduct or market entry by another party.

- 3.2.6 Both entities have interests in the kinds of information that arise from market monitoring. They also have an interest in ensuring that monitoring activities are coordinated wherever appropriate to avoid unnecessary duplication of effort. To this end the Commerce Commission and Authority have established a Memorandum of Understanding to coordinate their respective roles. This does not alter the requirement that each entity is independent and must fulfil its respective statutory objectives and functions.

3.3 Distinction between monitoring and compliance

- 3.3.1 The Authority has a compliance function under the Act in terms of monitoring compliance with the Act, regulations under the Act, and the Code.
- 3.3.2 Industry and market monitoring will operate separately and independently from the Authority's compliance monitoring function. Information obtained under the Authority's information gathering powers for the purpose of industry and market monitoring will not be used in relation to the Authority's compliance function unless, in undertaking the industry and market monitoring, the Authority identifies a compliance issue of such seriousness that the information obtained should be referred to the Authority's compliance function.⁹
- 3.3.3 The referral of any information from industry and market monitoring to the Authority's compliance monitoring function must be authorised by the Authority's Chief Executive. In such circumstances, the Authority will notify the relevant person(s) of the referral.
- 3.3.4 Within this context the information and analytical tools produced for the purposes of market monitoring may be used by the Authority's Compliance team, much as they may be used by the Authority's Market Operations and Market Design teams.

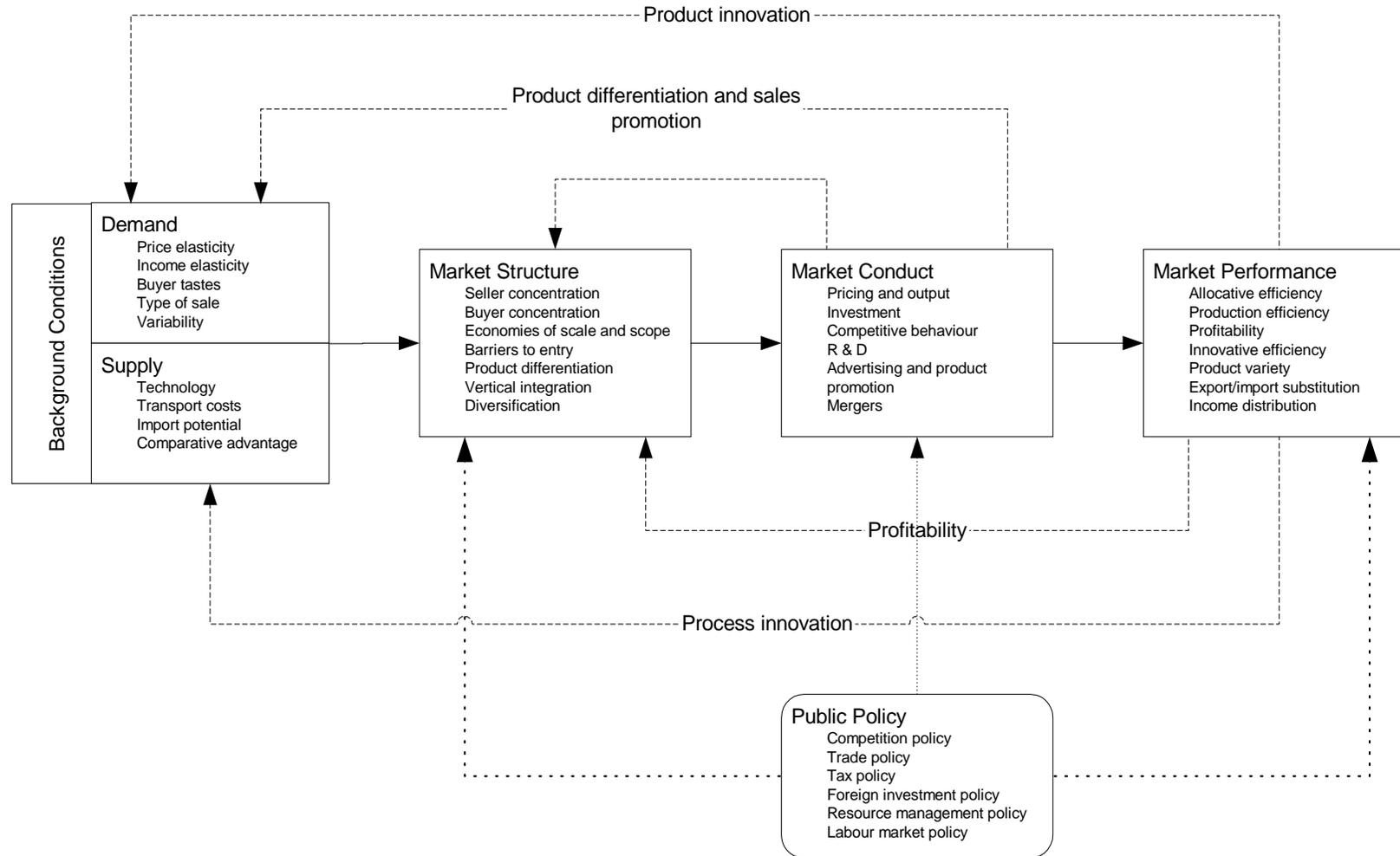
⁹ See <http://www.ea.govt.nz/document/12188/download/industry/monitoring/reports-publications/> for an overview of the Authority's information gathering powers and the general principles and procedures that the Authority must follow when using its information gathering powers for the purpose of undertaking its industry and market monitoring function.

4. Approach

4.1 Structure-conduct-performance

- 4.1.1 An internationally-accepted way of examining a sector's competitiveness is to use the 'Structure-Conduct-Performance' (SCP) framework. This provides the starting point for the Authority's monitoring framework.
- 4.1.2 The simple premise is that the structure of the market determines the conduct of its participants. This conduct drives outcomes. The more competitive the structure, the more competitive the conduct of participants and the more efficient their performance. The dimensions of the SCP framework are summarised in Figure 1.
- 4.1.3 This framework provides a basis for pulling together different determinants of competition and highlighting their interdependencies. It also links to a menu of competition metrics and indicators which will be drawn from during the Authority's monitoring activities.
- 4.1.4 That said, no single indicator – or set of indicators – will provide definitive information on the competitiveness of the electricity market in New Zealand. Assessing the competitiveness of the industry requires a deep understanding of what is driving a suite of indicators, whether these are temporary or permanent trends and how the lags between decision-making and market impacts operate. Furthermore, the particularities of electricity markets tend to require some adaptation of metrics and development of bespoke monitoring tools and analysis.
- 4.1.5 The SCP framework and associated measures do, however, have the benefit of being able to be applied across a range of market segments and therefore has relevance to the Authority's monitoring function which is concerned with competition in the various segments of the electricity market.

Figure 1 The structure-conduct-performance framework



Source: NZIER

Structure

- 4.1.6 Measures of market structure and the kinds of indicators used to evaluate them are summarised in Table 1.

Table 1 Measures of market structure

Measure	Importance for competitive pressure in industry	Potential indicators
Seller concentration	Low concentration reduces risk of any one firm unilaterally affecting prices; or of lasting collusion between groups of firms	Sum of market shares; Market share concentration ratio; Herfindahl-Hirschman Index; Pivotal supplier indicator; Residual supply index; Residual demand analysis
Buyer concentration	Determines the degree of power consumer groups have in bargaining with sellers	% of customers switching suppliers per month/quarter/year; customer complaints
Barriers to entry	Low barriers to entry place pressure on incumbents to display competitive pricing behaviour	Number of entries/exits as % of total number of suppliers; closures/mothballing as % of total capacity; degree of vertical integration e.g. retail sales as % of own generation
Product differentiation	The more homogenous the product sold by different suppliers, the greater the potential for switching by consumers between products	Range of spot/forward contracts; number of retailers actively seeking customers by area and type; types of price contracts available to customers
Availability of information on alternative suppliers	The cheaper and more widely available this information is, the easier it is for consumers to switch between suppliers	Transparency/availability of info on pricing and contract options (e.g. on internet)

- 4.1.7 It is important to note that market concentration may simply be a consequence of economies of scale, which can benefit consumers. If barriers to entry are low, the threat of new entrants can be sufficient to neutralise any market power suggested by the market share of the incumbent(s).
- 4.1.8 Indeed structures which might be problematic elsewhere may be an inherent feature of the electricity market. The presence of large fixed and sunk costs in generation, for example, acts as a barrier to entry because the minimum efficient scale of operation is high. This needs to be taken into account in the context of workable competition.

Conduct

- 4.1.9 Market conduct is perhaps the most challenging part of the SCP framework. The measures are clear in principal but practically difficult to implement. This is reflected in the relative paucity of specific indicators to evaluate market conduct (see Table 2) compared to market structure and performance measures.
- 4.1.10 These difficulties are pronounced in the context of how electricity markets operate in the short run. In the short run, electricity markets are characterised by both inelastic supply and inelastic demand. Under these conditions, strategic

pricing becomes prevalent and some degree of strategic pricing, which may be undesirable in other markets, is unavoidable.

Table 2 Measures of market conduct

Measure	Why important for competitive pressure in industry	Potential indicators
Price-cost relationship	Prices should reflect costs. If they are persistently higher, this suggests suppliers have market power.	Price-cost margin index; Lerner Index.
Revenue and input costs	In a competitive market, if input costs rise then marginal costs and marginal revenue rise by the same amount.	Panzar-Rosse H Statistic
Output	If there is evidence of firms withholding output at what should be a profitable price, this indicates some degree of market power being exercised.	Economic withholding analysis; Physical withholding analysis
Curious bids and offer	A large number of bids and offers that are hard to reconcile with profit-maximising behaviour in a competitive market is an indication that participants are trying to lessen competition	Number of bids that are hard to explain; plus published investigations into specific instances
Collusion opportunities	The more often the key participants have the opportunity to engage as a group, the higher the chance of joint actions that might lessen competition	% of suppliers who are members of an industry body; number of joint letters/submissions to regulators or Ministers

4.1.11 Further, the informational requirements are high for determining if strategic pricing is undermining workable competition in the electricity sector.

4.1.12 Nonetheless, monitoring this aspect of the market is essential for monitoring competition in general. Long run dynamic efficiency gains from competition are, after all, only the sum result of many periods of short run pricing behaviour.

4.1.13 In this context, one area of focus for the Authority is to improve the transparency around pricing behaviour and to improve scrutiny of bids and offers. This may include:

- (a) scrutinising forward offer curves;
- (b) publishing offers;
- (c) replicating market clearing prices; and
- (d) conducting model based simulations of strategic behaviour.

Performance

4.1.14 A competitive industry is ultimately one which satisfies the conditions of allocative, production and dynamic efficiency. Given the focus on long term benefits to consumers, a major interest of the Authority is, in principle, on measures of pricing trends; to the extent that these are a key factor in influencing investment and innovation within the sector (i.e. dynamic efficiency). Prices also embody much of the long term benefit to consumers of greater competition

because competition typically manifests itself in prices lower than they would otherwise be.

- 4.1.15 The difficulty of course is that current price realisations (i.e. spot prices) reflect past decisions. Consequently, measurement of market performance must include measures of the effectiveness of the price discovery process and the creation of forward prices; to provide assurance that forward prices reliably reflect expectations of future spot prices and that those prices signal an appropriate investment and innovation mix. This includes monitoring the development of prices for hedge contracts and similar financial instruments (such as Financial Transmission Rights).

Table 3 Measures of market performance

Measure	Why important for competitive pressure in industry	Potential indicators
Allocative efficiency	In a competitive market, resources are allocated to their highest value uses	Degree to which generation investment favours lower cost options over higher cost options; extent to which seasonal and diurnal variances in production costs are reflected in prices
Production efficiency	In a competitive market, outputs are produced at least cost	Trend in reserve margin; actual less optimal reserve margins; ratio of energy production to total average capacity; single factor efficiency ratios (e.g. FTEs per MWh); Total Factor Productivity;
Dynamic efficiency	Changes to production processes and resource allocation are required to ensure that allocative and production efficiency are maintained over time	Measures of retail and wholesale product innovation; rate of adoption of new technology compared with efficient rate
Profitability/return on investment	No firm should be able to make supernormal profits on an ongoing basis unless it is linked to innovation and a pushing out of the production efficiency frontier.	Cost to income ratios; Net revenue benchmark analysis; Return on investment; Return on equity
Pricing trends	Can compare with own-market forecasts and trends in other markets to check for unusual patterns that might indicate a lack of competition	Nodal price comparisons; actual vs. forecast comparisons; market load vs. price

Source: NZIER

4.2 Likely metrics and measures in practice

- 4.2.1 In theory there are any number of potential indicators of the SCP of an industry, as shown in the Tables above. Indeed, given the range of issues falling within the scope of the Authority's monitoring function, there may be a need to deploy a large number of these from time to time as situations demand.
- 4.2.2 Table 4 summarises the extent to which different measures can apply to different market segments. The indicative ratings of applicability or relevance take account of the extent to which the measures are useful in the New Zealand context and how easy they are to apply. The ratings are indicative only.

Table 4 Application of competition measures across market segments

	Wholesale	Distribution	Transmission	Ancillary	Hedge	Retail
<i>Economic, Structure</i>						
Market shares	√√√	√	√√	√√√
Market share concentration ratio	√√√	√	√√	√√√
Herfindahl-Hirschman Index	√√√	√	√√	√√√
Pivotal supplier indicator	√√√	√	√√	√
Residual supply index	√√√	√	√√	√
Residual demand analysis	√√	√	√	√
Homogeneity of products and services	√√	√√	√√	√√
Barriers to entry	√√√	√√√	√√√
<i>Economic, Conduct</i>						
Price-cost margin index	√√	√√	√√	√√	√√	√√
Lerner Index	√√	√√	√√	√√	√√	√√
Panzar-Rosse H Statistic	√√	√√	√√	√	√√	√√
Economic withholding analysis	√√	√√	√√	√
Physical withholding analysis	√√	√√	√	√
Curious offers and bids	√√√	...	√	√	√√√	√
Availability of market information	√	√√	√	√√√
Ease of switching suppliers	√	√	√	√√√
Conditions for collusion	√√	√	...	√	√√	√√
<i>Economic, Performance</i>						
Presence of excess capacity	√√	√√√	√√√
Single factor efficiency ratios	√√√	√√√	√√√	√	...	√
Total factor productivity	√√√	√√√	√√√	√	...	√√
Price monitoring	√√√	√√√	√	√√√	√√√	√√√
Cost to income ratios	√√√	√√√	√	√√	...	√√√
Net revenue benchmark analysis	√√√	√√√	√	√√	...	√√√
Return on investment	√√√	√√√	√√√	√	...	√√√
Return on equity	√√√	√√√	√√√	√	...	√√√

Notes: (1) Applicability/relevance scale: ... = not at all applicable; √ = Low; √√ = Medium; √√√ = High.

Source: NZIER

4.2.3 In practice, there is ambiguity around the relevance of competition metrics to the different segments of the market; because of vertical integration and a lack of clear boundaries across market segments. Indeed in many cases focussing on one segment or another is artificial and somewhat arbitrary. There will also be elements of each segment for which measures are applicable and others where they are not.

4.2.4 That aside, in practice, data and time constraints, collection and calculation costs and consideration of the specifics of the New Zealand industry all affect the

number of indicators that can realistically be expected to be considered each period.

- 4.2.5 The choice of indicators to be produced routinely will be driven by criteria such as:
- (a) relevance - how closely the indicator assesses the measure of interest;
 - (b) credibility - quality of data for calculation; and
 - (c) practicality - ease and cost of calculation.
- 4.2.6 Taking into account these criteria - and particularly practicality - a range of possible indicators is shown in Table 5.
- 4.2.7 Once the set of indicators is determined, the next step is to decide the relevant benchmark for each indicator. In general terms there are two broad options:
- (a) comparing the electricity market as a whole against:
 - (i) international electricity markets;
 - (ii) other markets in New Zealand; and
 - (iii) target performance; and
 - (b) comparing individual participants against the market average or a market benchmark.
- 4.2.8 Given the focus of the Authority's monitoring function, the former is the more appropriate option, although there will be a certain amount of focus on individual participants in the process of examining issues such as bid and offer behaviour.

Table 5 Possible indicators of competition

Indicator	Calculations and considerations	Relevance (see definitions in Table 4)					
		Wsale.	Dist.	Trans.	Ancil.	Hedge	Retail
Structure							
Market share concentration ratio	Concentration ratio of, for example, top three suppliers: $CR3 = (1/n \times \text{share}_{\text{supplier } 1}) + (1/n \times \text{sum of shares}_{\text{suppliers } 1 \text{ and } 2}) + (1/n \times \text{share}_{\text{suppliers } 1,2 \text{ and } 3})$, where n = total number of suppliers. Herfindahl-Hirschman Index: $HHI = (\text{sum of squares of market shares of all suppliers}) \times 10,000$. Easy to calculate; challenge is defining appropriate markets and 'thresholds'	√√√	...	...	√√	√√	√√√
Residual supply index	Identifies pivotal suppliers – those most likely to influence price. $RSI_i = (\text{total capacity} - \text{supplier } i\text{'s relevant capacity}) / \text{total demand}$ The index measures the percentage of supply capacity remaining in the market after subtracting supplier i's supply capacity. If e.g. $RSI_i > 100$ per cent, other suppliers have sufficient capacity to meet market demand and supplier i should have little influence on market clearing price	√√√	...	...	√	√√	√
Barriers to entry	<ul style="list-style-type: none"> Number of entries/exits as % of total number of suppliers; closures/mothballing as % of total capacity; and degree of vertical integration e.g. retail sales as % of own generation	√√√	...	...	...	√√√	√√√
Conduct							
Curious offers and bids	Number of bids that are hard to explain; plus published investigations into specific instances. Potential to be time consuming.	√√√	...	√	√	√√√	√
Availability of market information	Number of suppliers who make available on the internet full information about products and services, prices, charges, forward price information and contract details.	√	√√	...	...	√	√√√
Ease of switching suppliers	Percentage of customers switching suppliers per month or per year. What % might be targeted?	√	...	...	√	√	√√√
Performance							
Single factor efficiency ratios	<ul style="list-style-type: none"> Labour efficiency: FTEs per MWh of net power output; labour efficiency: FTEs per kilometre of lines; materials efficiency: expenditure (\$) per MWh of net power output; materials efficiency: expenditure per kilometre of lines; capital productivity: capacity factor (percentage), reserve plant margin (percentage); adjusted capital stock efficiency: kW of operable adjusted installed capacity per MWh of output produced; and 	√√√	√√√	√√√	√	...	√

	<ul style="list-style-type: none"> partial productivity indices of growth/decline over time 						
Total factor productivity	Ratio of output to input quantity, with inputs indexed and weighted by cost share. Resource intensive.	√√√	√√√	√√√	√	...	√√
Price monitoring	<ul style="list-style-type: none"> compare real-time price with forecast price: can show whether the earlier offers and bids are efficient predictors of real-time price and highlight any unusual deviations; compare market price with prices in adjacent markets (nodal price comparisons): can show whether there is efficient arbitrage (prices should move together unless markets are separated by congested transmission); compare prices for energy and ancillary services – reserves, frequency keeping, voltage support and black start: can show whether prices reflect the relevant opportunity costs of offering these services; compare market price with system load: can show whether high prices are due to high demand; price trends: moving averages or other trend analysis can reveal patterns concealed by day-to-day volatility; and price setting: correlation between the frequency with which a supplier sets the market price and whether it is a net buyer or seller, the level of demand, time of day or other market characteristics: can show if net seller is consistently able to set higher prices. 	√√√	√√√	√	√√√	√√√	√√√
Cost to income ratios	Ratio of operating expenses to total operating income	√√√	√√√	√	√√	...	√√√

Source: NZIER

5. Organisation and output

- 5.1.1 The industry and market monitoring function is being undertaken by the Market Performance team within the Authority. It will monitor and report on a broad range of factors that influence end-use electricity prices, reliability and efficiency.
- 5.1.2 The main activities to be carried out include:
- (a) data collection, processing, storage and dissemination;
 - (b) routine screening and testing to identify and quantify potential issues;
 - (c) continual development of benchmarks and indices by which to measure and report on all aspects of industry performance;
 - (d) development and maintenance of open source modelling tools and expertise to support quantitative analysis and to automate processes to the maximum extent possible;
 - (e) in-depth analysis of topics of interest to the Authority; and
 - (f) publication of findings for a range of audiences.
- 5.1.3 In terms of outputs, the various monitoring activities can be characterised by three distinct lines of work:
- (a) routine monitoring to test, screen, measure, and report industry performance against specified benchmarks and thresholds;
 - (b) in-depth reviews and studies of particular topics that arise from time to time and/or are requested by the Minister of Energy and Resources; and
 - (c) market facilitation measures including educational initiatives, building market monitoring infrastructure and disseminating tools to improve market participants' own monitoring capacity and understanding of the work of the Authority.

5.2 Routine monitoring

- 5.2.1 Routine monitoring will produce regular standardised measures and metrics. The range of reporting will include many of the measures discussed above including:
- (a) basic descriptive statistics that summarise prices, quantities, shares and counts; and
 - (b) market performance metrics that provide information on the state of competitive pressures.
- 5.2.2 Production will be automated and results disseminated via a customisable web interface.

- 5.2.3 The types of reports, plots and metrics to be made available in this way will encompass the 'market statistics and reports' currently accessible from the Authority's website.¹⁰

5.3 In-depth reviews

- 5.3.1 In-depth reviews and studies will occur periodically as required, and will typically be based on bespoke analysis rather than relying on simple descriptive statistics.
- 5.3.2 Two such reports have already been prepared and investigated; the run-up in wholesale prices in December 2010 and the high levels of constrained-on generation in late January 2011.¹¹
- 5.3.3 Reports such as these will typically culminate in recommendations for possible Code amendments aimed at improving market performance.
- 5.3.4 A comprehensive annual 'state of the market' report is also planned. The first of these will be published in early December 2011, covering the Authority's first year of operation. Thereafter the annual 'state of the market' reports will follow the year ended 30 June. These may be complemented by annual December releases of less comprehensive and non-technical reports.

5.4 Investigation stages

- 5.4.1 Typically an in-depth investigation will be the final step of a sequence of escalating investigation stages. The investigations are targeted at gathering sufficient information to decide whether a Code amendment or market facilitation measure should be considered.
- 5.4.2 **Stage I (Enquiry):** At the first stage, routine monitoring results in the identification of circumstances that require follow-up. This stage may entail the design of low-cost ad-hoc analysis, using existing data and resources, to better characterise and understand what has been observed. Typically there is no pre-announcement the Authority is doing this work.
- 5.4.3 This stage may result in no further action being taken if the enquiry is unlikely to have any implications for the competitive, reliable and efficient operation of the electricity industry. In this case the Authority publishes its enquiry only if the matter is likely to be of interest to industry participants.
- 5.4.4 **Stage II (Review):** A second stage of investigation occurs if there is insufficient information available to understand the issue and it could be significant for the competitive, reliable or efficient operation of the electricity industry. Relatively informal requests for information are made to relevant service providers and industry participants. Typically there is a period of iterative information gathering and analysis. The Authority would typically publish the results of these reviews

¹⁰ See <http://www.ea.govt.nz/industry/market/statistics-reports/>.

¹¹ See <http://www.ea.govt.nz/industry/monitoring/reports-publications>.

but wouldn't pre-announce it is doing this work unless a high level of stakeholder or media interest was evident.

- 5.4.5 **Stage III (Formal Investigation):** Finally, under a full investigation, the Authority may exercise statutory information gathering powers under section 46 of the Act to acquire the information it needs to fully investigate an issue. The Authority would generally announce early in the process that it is undertaking the investigation and indicate when it expects to complete the work. Draft reports will go to the Board of the Authority for publication approval.
- 5.4.6 The outcome of any of the three stages of investigation can be either a recommendation for a Code amendment, provision of information to a Code amendment process already underway, a brief report provided to industry as a market facilitation measure, or a no further action.
- 5.4.7 From the point of view of participants, repeated information requests are generally concerned with Stage II; trying to understand the issue to such an extent that a decision can be made about materiality.

5.5 Market facilitation and monitoring infrastructure

Data warehouse project

- 5.5.1 A major initiative that is currently underway is the design and construction of a comprehensive data warehouse. The main purpose of the data warehouse is to enable the Market Performance team to have access to data that is timely, reliable, consistently defined over time, and accessible in a format that enables immediate use in further analysis. In addition, data contained in the data warehouse that is not confidential will be accessible to the general public via a web browser interface. This capability will be available within the Authority's first year of operation.
- 5.5.2 Besides enabling the querying, viewing, and downloading of data, the web browser interface will also provide a gateway to extensive reporting capabilities. Many of the simple metrics that are able to be computed mechanically, i.e. without requiring model-based analysis, will be accessible from the data warehouse's reporting facilities. For example, interested parties will be able to request and instantly receive reports and plots on retail switching, generator offers, and many other measures of market performance.
- 5.5.3 Basic half-hourly market data such as final nodal prices, demand quantities, network topology, branch flows, and generator offers going back to the establishment of the market in New Zealand are currently being loaded into the data warehouse. Monthly data related to retail has already been loaded. The process of incorporating the various ad hoc databases will continue in the coming months so that the data warehouse becomes the primary repository for data held by the Authority. The centralised dataset will be superseded by the data warehouse.

Open source modelling tools

- 5.5.4 The Market Performance team develops and maintains a suite of models to support not only its industry and market monitoring work but the broader Authority work programme. GEM and vSPD are two such models familiar to the sector. Other tools recently developed include:
- (a) 'back-of-the-envelope' Excel-based versions of GEM and vSPD, which are useful for illustrating central concepts in newly designed policies, e.g. scarcity pricing, without all the complexity and realism of the fully functional model; and
 - (b) a visualisation tool for analysing generator offer data.
- 5.5.5 The Authority plans to continue its practice of making these tools available to interested parties. In the case of vSPD, the data warehouse will automatically produce the daily input file to enable to the previous day's final pricing cases to be replicated (and experimented with) within minutes of the pricing manager publishing final prices.
- 5.5.6 The Authority considers that making these tools available is in keeping with its statutory objective to serve the long-term benefit of consumers because a powerful analytical and monitoring capability is made available to parties that would otherwise be unable to avail themselves of such a capability.

Education and outreach

- 5.5.7 Section 16(1)(f) of the Act requires education and outreach activities to be undertaken as part of the market facilitation function. Accordingly, plain language 'fact sheets' will periodically be prepared and published. These will generally cover enduring concepts and ideas. For example, topics such as the derivation and role of long-run marginal cost or the operation of FTRs are likely candidates for fact sheets to be prepared by the Market Performance team.

5.6 Human resources

- 5.6.1 The Market Performance team is led by a General Manager, reporting directly to the Authority's Chief Executive. Nine staff report to the General Manager, Market Performance. Of the nine:
- (a) three are engaged in activities associated with data acquisition, data cleaning and integrity checking, storage, and dissemination;
 - (b) three are occupied in providing analytical support to other teams in the Authority, for example, the current scarcity pricing and FTR projects being undertaken by the Authority's Market Design team; and
 - (c) three work full-time on industry and market monitoring.
- 5.6.2 It is envisaged that as other work groups build up their own analytical capability, the requirement to have three full-time members of the Market Performance team

providing support will diminish. As that occurs, the freed-up capacity will be re-deployed within the monitoring function.

5.7 Monitoring service providers

5.7.1 The Authority contracts with a number of service providers in regard to system operation, reconciliation, clearing, pricing, and the provision of a registry and the wholesale information and trading system. Monitoring of service provider performance is not part of the industry and market monitoring function. That role is undertaken by the Authority's Operations Development team.