A RISK-FOCUSED PERFORMANCE MANAGEMENT SYSTEM FRAMEWORK FOR PLANNING CHANGE IN ORGANISATIONS SUBJECT TO SIGNIFICANT ENVIRONMENTAL PRESSURES AND UNCERTAINTY

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A Risk-Focused Performance Management System Framework for Planning Change in Organisations Subject to Significant Environmental Pressures and Uncertainty

Binh Bui, Chris Hunt and Carolyn Fowler

Professional summary:

The advent of emission trading schemes (ETSs), nationally and internationally has the potential to change the playing field for all. At a government level, the introduction of the ETS in New Zealand will go someway to meeting the New Zealand government's commitment under the Kyoto protocols. At an organisational level, for heavy emitters such as power generators, an ETS introduces another level of business risk exposure and associated uncertainty. The level of risk exposure and uncertainty, due to differing power generators having differing generation bases (thermal, renewable, and/or a thermal/renewable mix), is likely to differ between power generators. This has potential implications for the competitiveness of individual organisations and their performance management systems.

The analysis conducted in the paper reveals that prior to the advent of the ETS, New Zealand electricity gentailers operate in relatively homogenous economic and regulatory environments. These environments are characterised by a number of significant external and internal organizational risks. Externally, these risks relate to government's regulation, market vertical integration and concentration, exposure to the electricity spot market, competition on the retail market and the issues around the security of electricity supply. Internally, these gentailers face the uncertainties and the potential impacts on firm performance arising from the security of fuel supply, their existing infrastructure, vertical integration strategy, retailing strategy, ownership structure and its associated factors.

The introduction of the ETS has the potential to not only increase the uncertainty of the existing operating environments of the electricity generators and retailers (gentailers) but also to increase the differences between these firms in terms of their respective business risk exposures. Externally, some of these firms will be more exposed to higher fossil fuel prices and further uncertainties relating to fossil fuel price volatility and availability while simultaneously bearing the risks inherent in the carbon trading market. Retail competition is also likely to change towards a focus on a 'green and clean' electricity brand. These risks add to the existing regulatory uncertainties around the design and operations of the ETS. Internally, these firms will incur differing additional fossil fuel and carbon costs, along with the cost of complying with ETS-related requirements. The ETS is also likely to influence generation and retailing strategies of these gentailers to different extents.

The level of environmental uncertainty and risk experienced by New Zealand gentailers requires appropriate adjustments in the performance management system (PMS) if these gentailers are to maintain and improve their economic performance and market competitiveness. This paper develops a framework that uses a risk management lens in order to examine the impact of the potential ETS-driven uncertainties and risks on the PMS of New Zealand gentailers. Using secondary (published) data and applying the framework developed an analysis of the potential PMS change implications due to the added ETS-driven uncertainty and associated business risk is undertaken. The results of the analysis suggest that in order to manage effectively the increased ETS-related risks, the gentailers should review their organisational objectives and strategies to increase the emphasis on emissions management. Further, they need to design selective additional performance measures to monitor the specific ETS risks and the performance of the ETS-risk mitigation plans.

In addition to the findings related to the organisational impacts of the ETS, the paper makes a number of observations on the potential ETS implications for industry and sectoral macro-economic performance. The findings of this paper provide interesting practical insights to NZ electricity gentailers, their management and owners, government, regulators, and other soon to be ETS-affected organisations, stakeholders groups, and the wider community.

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ABSTRACT

In 2007, the New Zealand government, in principle, adopted the implementation of a cap and trade emissions trading scheme (ETS) in the energy sector from 2010. The objective of this paper is to develop a risk-focused performance management system (PMS) planning framework for organisations undergoing externally-driven regulatory change that constrains their operating environment and increases business and operating risk exposure. This paper focuses on the New Zealand electricity generators and retailers (gentailers). It utilises contingency theory and secondary data to explain PMS change implications due to the altered business risk exposure potential of the proposed emissions trading regime, and the associated carbon constraints this regulatory change imposes on these organisations' operating environment.

The risk-focused PMS planning framework developed in this study, allowed the identification of the drivers and attributes that, due to the ETS adoption, potentially have significant negative business risk impacts for some gentailers. The findings arising from the application of this risk-focused PMS framework to the New Zealand electricity gentailers suggest that the predominantly thermal-based generators will be more disadvantaged due to a reduction in competitiveness and profitability. This reduction is the result of the interaction between the ETS-related risks and the sources and types of external and internal environmental uncertainty associated with the regulatory change. The business risks identified not only influence organisational-level PMS design, function, and operation needs, but also have economic consequences at sectoral and national levels, particularly in relation to national security of electricity supply.

The paper provides insights into an organisation's potential internal adjustments in response to increases in internal and external business risks due to the introduction of the ETS and changing wider environmental management expectations. Theory implications relate to the role and use of risk in improving the application of contingency theory in explaining organisational change under environmental pressures. Additionally, the paper contributes to the management accounting research through the examination of the internalisation of externalities, such as wider climate change management. Consequently, the findings of this study will be of potential interest to academics, managers, accountants, other professionals, governments and policy-makers.

Keywords: performance management system change, contingency theory, emissions trading, risk management.

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INTRODUCTION

Management accounting research relating to organisational change is a relatively new and emerging area particularly as it relates to performance management system (PMS) design, function, and operation (see the review in Burns & Vaivio 2001). This paper operationally and academically contributes to that literature by examining the implications of the emerging global phenomena of emissions trading schemes (ETS) on PMS using the New Zealand power generators and retailers (hereafter referred to as gentailers) as its context (Burtraw, Palmer, Bharvirkar & Paul 2001, Ellerman, Joskow & Harrison 2003, Sorrell and Sijim 2003, Reinaud 2004).

In 2007, the New Zealand government, as a response to climate change management and its commitments under the Kyoto protocols (NZ Government 2007a), has, in principle, adopted the implementation of an ETS for the energy sector from 2010. Cap and trade ETS are not new and have operated in various forms in the US and Europe (Ellerman *et al* 2003). However, research relating to such ETS arrangements internationally has tended to focus on the regulation and the performance of that regulation at national and industry levels and not the organisational-level PMS impacts of that regulation (Godby, Mestelman, Muller, & Welland 1997; Holtsmark & Mæstad 2002; Ellerman *et al* 2003; Reinaud 2004; Szabó, Hidalgo, Ciscar, & Soria 2006). This study addresses this operational gap by examining the potential impacts of the ETS on gentailers' PMS.

In this paper, a risk-focused PMS change planning framework is developed, employing theoretical insights from contingency theory (Galbraith 1973, Otley 1999, Chenhall 2003) and integrating them into a risk management perspective (Crockford 1986, Alexander & Sheedy 2004). Contingency theory is used in the identification and definition of sources and types of economically-focused contingent factors which may influence PMS design, function and operation. The risk management standard, AS/NZS 4360:2004, is utilised to provide a common measurement lens in determining the degrees of uncertainty that might be attributable to different contingent factors. Employing this risk management lens facilitates the application of contingency theory to cross-sectional management accounting research due to improved comparability (Chenhall 2003). The framework developed relies on secondary data about each gentailer for its genesis and testing.

The study provides a potential extension to contingency theory in explaining organisational change by incorporating aspects of risk management. Further, insights are gained as to how the drivers and attributes of PMS change have similar and different consequences for different organisations. In doing so, understanding is gained in terms of the differing organisational internal accounting and management adjustments required in response to increased levels of internal operating risks and external business risks driven by ETS introduction and changing views on climate change. The organisational consequences of internalising the externality relating to the wider environmental management objectives of ETS, also has implications for regulators and government decision-makers. The findings of this study will be of interest to them as well as academics, managers, accountants, other professionals and governments, and policy-makers.

Given that the primary aim of this study is to develop a framework that improves understanding of how an event, such as ETS, can affect an organisations' performance and associated PMS, the rest of the paper is organised as follows. In the next section, an overview of the industry and regulatory background to the study is provided. In this section the study organisations are identified and their pre-ETS comparative external business environments and internal operating environments are examined. The potential risks and uncertainties arising from the ETS implementation are then identified and included in the organisational comparisons. Informed by the preceding discussion, the choice of theory is justified, based on which a theoretical framework is developed. This is followed by a statement of the methodology adopted to test the proposed framework. The following section reports the results acquired from employing this framework to analyse the ETS and associated business risk impacts on the New Zealand gentailers. The paper ends with summary comments and conclusions.

INDUSTRY AND REGULATORY BACKGROUND OVERVIEW

The need for human-generated greenhouse gas emission (GHGs) to be managed, at all levels within society is arguably the most significant event to impact on organisational[1] performance management in this century, if not the last. Governments, internationally (Burtraw, Palmer, Bharvirkar & Paul 2001, Ellerman, Joskow & Harrison 2003, Sorrell and Sijim 2003, Reinaud 2004), perceive the cap and trade ETS as a mechanism for providing economic incentives for GHG emitters to contribute to climate change (environmental) management. In these terms, ETS provides an economic mechanism via which the economic activities of an organisation can be linked to environmental outcomes. In doing so, it internalises to the organisation, the economic management implications of an externality, that of the wider management of the environment. This is more so the case in New Zealand where, in August 2007, the New Zealand Government announced its plan for implementing the Cap-and-Trade Emissions Trading System (ETS) on a nation-wide level (New Zealand Government 2007a). This

[1] The definition of organisation adopted in this paper is that from AS/NZS4360: 2004 which is that an organisation is a "group of people and facilities with an arrangement of responsibilities, authorities and relationships" (para 1.3.10).

is the government's preferred strategic action to reduce GHGs, identified as one of the primary causes of climate change (Inter-governmental Panel on Climate Change 2007, New Zealand Government 2007b). The government, in principle, has undertaken to adopt whole-of-country application of ETS by 2013. However, for the New Zealand electricity industry, 2010 is the targeted year of adoption (New Zealand Government 2007a).

The implementation of the ETS directly impacts on the internal organisational operating risk and the external business risk of those involved in the electricity industry as well as others. In doing so, the organisation's PMS will need to adapt to monitor emission levels and their related costs and support the mitigation of the associated changes in the sources and types of organisational business risks[2]. In order to understand the implications of ETS adoption in the context of this study, the affected organisations and their pre-ETS contingent risk exposure and PMS impacts are first identified.

Pre-ETS Internal and External Risks of New Zealand Electricity Gentailers

In the New Zealand, power generation and retailing sector, there are five organisations or gentailers: Contact; Genesis; MRP; Meridian and TrustPower and they are responsible for 91% of national power generation and account for 95% of the retail market (Murray & Stevenson 2004). These organisations have been targeted for the 2010 application of ETS, and it is the PMS implications of that ETS-altered business risk exposure for these five organisations that is the focus of this paper. Prior to the proposed advent of the ETS, New Zealand electricity gentailers were exposed to internal and external business risks that traditionally characterise their operating environments. These risks are discussed next.

The external environment

External environmental factors relating to regulatory uncertainty; grid constraints; market concentration; vertical integration; market competition; exposure to wholesale prices; and security of electricity supply, potentially influence the design and use of gentailers organisational PMS. Although, generally, the gentailers have no or little control over these external factors.

The first and the most significant external source of uncertainty is the level of government regulatory intervention into the electricity industry prior to ETS adoption being considered. Uncertainty is high in relation to the functional separation between the electricity regulatory

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[2] The definition of risk adopted in this paper is provided by AS/NZS4360: 2004, (1.3.13) where risk is defined as:

> *The chance of something happening that will have an impact on objectives (NOTE 1: A risk is often specified in terms of an event or circumstances and the consequences that may flow from it. NOTE 2: Risk is measured in terms of a combination of the consequences of an event (1.3.4) and their likelihood (1.3.7). NOTE 3: Risk may have a positive or negative impact).*

Risk may also be referred to as operating risk in terms of an organisation's internal environment and business risk when referring to an organisation's external environment (Standards Australia & Standards New Zealand 2004).

bodies, the stability of current regulation and possibilities of new regulation or direct government intervention related to the electricity industry and markets (Murray & Stevenson 2004, Evans & Meade 2005). In addition, the gentailers have to satisfy resource management requirements in accordance with the Resource Management Act 1991 (RMA). In particular, the processes and procedures involved in applying for resource consents are considered complicated, uncertain, and obstructive to generation investment (Murray & Stevenson 2004). Furthermore, associated with the Government's recent proposal to adopt the ETS, are uncertainties relating to the design of the emissions trading market and emissions reporting and monitoring requirements (Business New Zealand 2008). These types of regulatory uncertainties influence electricity firms' generation/investment strategies and require appropriate changes in their organisational PMS (Langfield-Smith 1997 & 2005). These uncertainties are generated in the external environment, the source of which the organisation has little control over (Gay & Simnet 2005). The consequent implications for PMS design, functions, and operations lie in the need to incorporate regulatory uncertainty-monitoring measures so as to provide a risk mitigation function within the PMS.

Secondly, gentailers are exposed to the uncertainties and associated risks imposed by grid constraints and grid pricing (EC 2005). Grid constraints relate to the capacity limitations of the national transmission system that is operated and controlled by a state-owned-enterprise (SOE), TransPower. Grid constraints exert high impacts on the operational and investment activities of all the gentailers, while grid pricing influences each gentailer differently. The pricing model of the High Volume Direct Current inter-connection (HVDC) proposed in 2006 by the Electricity Commission results in significant cost increases for South Island generators, while North Island generators are barely affected (Meridian 2007a, Contact 2006). In terms of control, all these firms have little ability to reduce or remove grid constraints. However, they have some but limited influence on the policy of grid pricing (e.g. HVDC interconnection charges). Organisational PMS needs to be appropriately designed and used if the risks related to grid constraints and grid pricing are to be effectively monitored and managed.

Thirdly, market concentration and vertical integration in the retailing and generation sectors have direct impacts on the gentailers' operations, activities, and profitability. Prior research suggests that vertical integration is a strategy of hedging market risks, and reduces the incentive for the gentailers to abuse their market power (Hogan & Meade 2007). The gentailers have medium control over these factors at the industry level, however, they have full control over their own retailing and diversification strategies, but a very limited control over other firms' strategies. If a gentailer is to mitigate these sources, types and levels of risk, the PMS will need to include measures and functions that allow, in particular, the monitoring of changes in competitor strategy and the assessment of the impact that any of these changes may have on the firm's own strategy choices.

Fourthly, the break-up of the Electricity Commission of New Zealand (ECNZ) and the setting up of electricity markets have intensified competition in the generation and retailing sectors. By January 2003, the majority of the networks were covered by at least two competing retailers as shown in appendix A (MED 2004) and, from 2001 to 2007 there was a significant increase in the number of customer switches between retailers (MED 2007)**.** Further, the gentailers are exposed to trading risks on wholesale and retailing markets. The impacts of price fluctuations on each firm depend on the level of integration between its generation and retailing bases. Firms like Contact and MRP, which have more balanced integration, are exposed to lower price risks. Additionally, most of New Zealand gentailers are net sellers of electricity, except for TrustPower which is a net buyer (MED 2007). Future research can test the extent to which the gentailers will implement an interactive PMS[3] and design appropriate performance measures to monitor market volatility due to the critical impact of competition and price on a firm's profitability (Simon 1994, 1995).

Fifthly, under the current market arrangements, no industry player is responsible for security of electricity supply (SoS) on a nation-wide level. However, each electricity gentailer remains responsible for the supply of electricity to its existing industrial, business, and residential users. High levels of uncertainty and impact are experienced due to the unstable weather conditions and changes in the prices/costs and availability of alternative fuel sources (Evans & Meade 2005, NZIER 2007). The gentailers have high control over the SoS of their own generation and retailing commitments but only limited control over the SoS of the nation-wide supply (Evans & Meade 2005). Lack of SoS generates external and internal sources of uncertainty. At the external level, it relates to the capacity of all existing generators to sustainably meet demand. At an internal level, it is the ability of each firm to secure sufficient fuel supply and thus sufficient generation to meet their retailing commitments. The implications of SoS for the gentailers' PMS are the need for monitoring their fuel supply and generation capacity and the changes in the total electricity available on the wholesale market for purchases when generation falls below demand levels.

Table 1 below summarises the external environmental factors that are considered potential significant influencers of organisational PMS in the five major New Zealand electricity gentailers. The table attributes three qualities to each of these factors: uncertainty, control, and impact. "Uncertainty" includes the possibility of change in a factor, or lack of information required to assess the impacts of that factor on the firm (Galbraith 1973). "Control" refers to the ability of each gentailer in managing/minimizing such negative influences. In addition, where

[3] An interactive PMS often involves the selection of one control system by the senior managers for continous monitoring, and direct involvement with subordinates so as to generate rich discussion and dialogue on issues that have a strategic importance to the organisation (Simons, 19994, 1995).

relevant, it is implicitly assumed that firms have little control over most of the external environmental factors. "Impact" refers to the extent to which the factor exerts a negative influence on a firm's performance (Wilson & Shlyakhter 1997, Crouhy, Galai & Mark 2001).

Risk factor	Contact	Genesis	MRP	Meridian	TrustPower
Location	**NI + SI**	**NI**	**NI**	**SI**	**NI + SI**
Regulation					
Uncertainty	H	H	H	H	H
Control	M	M	M	M	M
Impact	H	H	H	H	H
Grid constraints					
Uncertainty	H	H	H	H	H
Control	L	L	L	L	L
Impact	H	H	H	H	H
Grid pricing (HVDC)					
Uncertainty	H	H	H	H	H
Control (on policy)	M	M	M	M	M
Impact	**H**	**L**	**L**	**H**	**H**
Market concentration and vertical integration					
Uncertainty	L	L	L	L	L
Control	M	M	M	M	M
Impact	H	H	H	H	H
Competition					
Wholesale market uncertainty	**H**	**M**	**M**	**M**	**H**
Retailing market uncertainty	H	H	H	H	H
Control	M	M	M	M	M
Impact	H	H	H	H	H
Security of electricity supply (SoS)					
Uncertainty	H	H	H	H	H
Control over Firm-level SoS	H	H	H	H	H
Control over national SoS	M	M	M	M	M
Impact by national SoS	H	H	H	H	H
Key					
L: low; M: medium; H: high (used to imply the level of uncertainty and impact that an external environmental factor may have on a firm and the degree of control that a firm has on that factor) SI: South Island; NI: North Island					

Table 1: External Environmental Risks Confronting New Zealand Electricity Gentailers

From Table 1, it is only the risk factors relating to ''Wholesale market uncertainty' (as regards competition) and 'Grid Pricing' impact where organisations appear to experience differing level of risk exposure (as indicated by the bolding). Contact and TrustPower experience high (H) levels of wholesale market uncertainty due to being exposed in both the North and South Islands markets. The differential regulatory treatment of North and South Island grid pricing compounds Contact and TrustPower risk exposure but also impacts on Meridian. Generally, the risk factor impacts of Regulation, Grid Constraints, Competition and SoS, are argued to be high for all five organisations. This implies that all five organisations are operating in a volatile and uncertain business risk environment. This would require each organisation to develop and operate a more sophisticated PMS.

The internal environment

In addition to external environmental risks, the New Zealand electricity gentailers also face a number of internally-driven uncertainties, including security of fuel supply, existing infrastructure, vertical integration strategy, retailing strategy, ownership structure and its associated factors (CAENZ 2003, New Zealand Government 2007c, NZIER, 2007).

One of the most acute internal uncertainties and associated risk impacts relates to the security of fuel supply for electricity generation. New Zealand hydroelectricity supply has always been variable due to the reliance on the weather for water flows and level of water storage (New Zealand Government 2007c). Moreover, 25% of New Zealand's total primary energy supply comes from the Maui gas field, making gas-fired generation capacity vulnerable to the failures of this facility (CAENZ 2003, 2005). In addition, to reduce New Zealand's GHG emissions, the government indicates little support for using coal as fuel for additional generation capacity (NZIER 2007). This poses an additional constraint on the availability of energy sources for use in electricity generation. However, the impacts of fuel shortage and uncertainties on existing and future generation plans and thus control systems, including PMS, depend on each firm's fuel choices (also referred to as its generation strategy). Mighty River Power (MRP), Meridian, and TrustPower are major hydroelectric generators, while the majority of electricity produced by Contact and Genesis is generated from thermal fuel sources (e.g. coal, geothermal, and gas). While these firms still maintain their historical generation focus (thermal or hydro), all have started/plan to use different alternative energy sources for future generation investment (as per Table 2).

Another group of internal uncertainties relate to each gentailer's existing generation infrastructure. All the gentailers have a mixture of old (inherited on commercialisation of the industry - MED 2004) and new generation plants, but the geographical distribution of these plants varies. Genesis and MRP have all of their plants in the North Island, Meridian the South Island while Contact and TrustPower have their plants distributed in both the North Island and South Island. In addition to being renewables-based generators, Meridian and TrustPower have a lower level of carbon emissions than the fossil-fuel fired and geo-thermal firms (Contact, Genesis, and MRP). All of the firms are exposed to high risk relating to the RMA requirements, depending on the specific natural resources used or affected by each generation project/asset. An electricity gentailer has to design a PMS that matches the specific characteristics of its fuel portfolio, age, and functions of its generation assets and relevant resource management requirements.

Possibly the most pertinent internal factor affecting the design and use of organisational PMS is firm strategy (Otley 1999). The critical strategies of the gentailers relate to the three areas of generation, retailing, and level of vertical integration. As discussed above, generation strategy is primarily determined by the availability and the choices of fuels used for each firm's electricity generation. In relation to vertical integration strategy, the level of integration between generation and retailing varies across the firms (as per Table 2). TrustPower, as the only net wholesale buyer, and Meridian and Contact, as two net sellers, have the highest levels of trading risks due to the significant discrepancies between their generation capacity and retailing commitments. Additionally, these firms pursue differentiated retailing strategies. Existing data suggest that retailing prices charged by each gentailer vary significantly with Meridian having the lowest charges and TrustPower having the highest charges in most of the distribution networks (MED 2006). Major changes in the market position held by each firm are also documented (MED 2004), which further suggests that these firms pursue different retailing strategies, As indicated in Appendix A, there are also differences in the retailing areas covered by each retailer. Only TrustPower, Contact, and Meridian can be considered as nation-wide retailers while Genesis and MRP operate primarily in the North Island[4]. All firms have direct control over their generation and retailing strategies as well as the level of vertical integration. The changes in any of these strategies will have direct impact on the design and use of organisational PMS (Langfield-Smith 1997, 2005, Chenhall 2005).

The last group of internal factors that potentially affect the gentailers' organisational PMS is ownership structure and its associated factors. Contact and TrustPower are publicly listed firms while Genesis, MRP, and Meridian are State owned enterprises (SOEs). Theoretically, the two publicly listed firms are exposed to higher financial risks and stronger market disciplines than the three SOEs (Vickers & Yarrow 1988, Shirley 1999). In terms of external reporting, all the firms are subjected to the Companies Act 1993 and Financial Reporting Act 1993 which require the adoption of New Zealand Equivalent to International Financial Reporting Standards (NZIFRS) in preparing annual reports (from 2007 for the SOEs and from 2008 for the listed firms). However, the two listed firms also have to comply with New Zealand Stock Exchange (NZX) listing rules (including continuous disclosure requirements) while the SOEs need to produce Statements of Corporate Intent (SCI), sustainability reports, and other disclosures at the request of their respective shareholding Ministers. Both state-owned and publicly listed firms need to have an appropriate PMS to measure, monitor, and report specific performance measures as required by

[4] Genesis are 100% North Island-based retailer, while MRP competes in some South Island networks in addition to the North Island ones.

their respective statutory and regulatory bodies. The internal environmental factors that may influence organisational PMS are summarized in Table 2 below.

Risk factor	Contact	Genesis	MRP	Meridian	TrustPower
Security of fuel supply (types of fuel used for electricity generation) / generation strategy					
Current focus	**Gas (NR) 50% Hydro (R) 35% Geothermal (R) 15%**	**Coal/gas(NR) 64% Hydro(R) 31% Cogeneration (NR) 4% Wind (R) 1%**	**Hydro (R) 71% Geothermal (R) 19% Cogeneration (NR) 9%**	**Hydro (R) 96% Wind (R) 4%**	**Hydro (R) 85% Wind (R) 15%**
Future investment	**Gas (NR) Geothermal (R) Gas Exploration**	**Gas (NR) Wind (R) Gas exploration**	**Wind (R)**	**Wind (R) Hydro (R)**	**Wind (R)**
Impact	H	H	H	H	H
Existing infrastructure (Generation assets and plants)					
Location	**NI (geothermal +gas) SI (hydro)**	**NI**	**NI**	**NI (Wind) SI (Hydro)**	**NI (hydro+ wind) SI (hydro)**
Age	Old + New	Old + New	Old + New	Old + New	Old + New
RMA requirements risks	H	H	H	H	H
Carbon emissions	**H**	**H**	**M**	**L**	**L**
Vertical integration (as a risk management strategy)					
Vertical integration type	**Seller**	**Seller**	**Seller**	**Seller**	**Buyer**
Trading risks	**H**	**nd**	**M**	**nd**	**H**
Retailing strategy					
Location	**Nation-wide**	**NI**	**Primarily NI**	**Nation-wide**	**Nation-wide**
Retailing strategy type	**Usage efficiency**	**Choice + Flexibility Usage efficiency**	**Service + Price**	**Price**	**Brand + Differentiation + Customer service**
Impact	H	H	H	H	H
Ownership structure and associated factors					
Ownership type	**Publicly listed**	**SOE**	**SOE**	**SOE**	**Publicly listed**
Market discipline risks	**H**	**L**	**L**	**L**	**H**
Finance risks	**H**	**M**	**M**	**M**	**H**
External reporting requirements	CA, FRA, NZIFRS				
	NZX listing requirements (continuous disclosure)		**SOE Act, SCI, Sustainability Report, other disclosure required by Shareholding Ministers**		**NZX listing requirements (continuous disclosure)**

Key
L: low; M: medium; H: high in relation to the level of risk, emissions or impact
SI: South Island; NI: North Island
NZIFRS: New Zealand Equivalent of International Financial Reporting Standards; NZX: New Zealand Stock Exchange.
R: renewable, NR: non-renewable; nd: no available data

Table 2: Internal Environmental Risks Confronting New Zealand Electricity Gentailers

Where relevant, the level of risk/impact of each factor on each of the gentailers is indicated. Table 2 shows that gentailers differ from each other significantly in their internal environments (as indicated by the bolding), while being exposed to relatively homogenous external economic and competitive environments (as shown in Table 1). In summary, Table 2 indicates that TrustPower and Meridian are 100% renewable-based generators while the other three firms use differing mixtures of renewables and fossil fuels in electricity generation. All of these firms are keen to increase their use of renewables in the future. This is related to their existing infrastructure and levels of carbon emissions. All the firms are vertically integrated between generation and retailing, but TrustPower is the only net wholesale buyer. Strategy-wise, the gentailers pursue differentiated retailing strategies and charge different retail prices. Finally, Contact and TrustPower are publicly listed firms while the rest are SOEs, which leads to corresponding differences in finance and market risks and external reporting requirements.

The introduction of the ETS is likely to bring about changes and/or increases in internal and external firm business risks. The organisational PMS, as a tool of strategy implementation, external reporting, and risk management needs to be designed and used in such a way that it allows the gentailers to manage their risks and achieve firm objectives in an effective and efficient manner (Kaplan & Norton 1992, Otley 1999, Simons 1999, Chenhall 2005). Consequently, in order to meet the new control, monitoring, and reporting requirements associated with the planned ETS implementation and optimize organisational performance, the gentailers need to integrate ETS and related environmental-management strategic considerations into the existing organisational PMS.

Implications of the ETS for the Internal and External Risks of New Zealand Electricity Generators

The proposed ETS will require firms to surrender emissions units to cover their emissions and by doing so, sends price signals to influence the decisions of businesses towards lower carbon-intensive operations and technologies that, in aggregate, help reduce emissions (New Zealand Government 2007c). The risks arising from the enforcement of the ETS for electricity generators are both internal and external. From an internal perspective, firstly, the thermal-based gentailers will incur additional production costs due to having to surrender emissions units to cover their emissions, or due to facing higher fuel prices (Emissions Trading Group 2007). However, this increase in production costs varies from gentailer to gentailer due the differences in their generation portfolios.

Secondly, the impact of the ETS on the profitability of each gentailer depends on the level of vertical integration between generation and retailing and the main fuel type used for electricity generation, as illustrated in Table 2 above and Table 3 below. The three scenarios in Table 3 are similar in the assumption that thermal fuel costs increase, but differ from each other in respect to the changes in wholesale and retail electricity prices. Table 3 suggests that in general, with the introduction of the ETS, the low-emitting and net-seller gentailers are likely to perform better financially and competitively than high emitting ones in the wholesale and retail markets.

	(Thermal) Fuel costs	Wholesale price	Wholesale profit	Retail price	Retail profit	Total profit
Scenario 1: Fuel costs increase, no change in wholesale prices and retail prices						
Net Seller (Thermal)						
Trading	Increase	Constant	Decrease			
Contract (1)	Increase			No change	Decrease	Big decrease
Contract (2)	Increase			Increase	No change	Decrease
Net Seller (Renewable)						
Trading	No change	Constant	No change			
Contract	No change			No change	No change	No change
Net Buyer (Renewable)						
Trading	No change	Constant	No change			
Contract	No change			No change	No change	No change
Scenario 2: Fuel costs increase, wholesale prices increase, no change in retail prices						
Net Seller (Thermal)						
Trading	Increase	Increase	No change			
Contract	Increase			No change	Decrease	Decrease
Net Seller (Renewable)						
Trading	No change	Increase	Increase			
Contract	No change			No change	No change	Increase
Net Buyer (Renewable)						
Trading	No change	Increase	Decrease			
Contract	No change			No change	No change	Decrease
Scenario 3: Fuel costs increase, wholesale prices increase, renewables-based generators reduce retail prices						
Net Seller (Thermal)						
Trading	Increase	Increase	No change			
Contract	Increase			No change	Big decrease	Big decrease
Net Seller (Renewables)						
Trading	No change	Increase	Increase			
Contract	No change			Decrease	Decrease	Little change
Net Buyer (Renewable)						
Trading	No change	Increase	Decrease			
Contract	No change			Decrease	Decrease	Big decrease

Table 3: Changes in Profitability of the New Zealand Electricity Gentailers under Different Costs and Prices Scenarios due to the Introduction of the ETS

Thirdly, the introduction of the ETS also increases compliance costs for the gentailers. They have to comply with ETS emissions-related monitoring and reporting obligations which are likely to cause additional costs, given that, the gentailers rarely reported such information in the past (Milne, Owen & Tilt 2001, Milne, Tregidga & Walton 2003). It is assumed that all firms will be subjected to a same level of impacts by the ETS-related requirements while having little control in minimizing/mitigating these externally-imposed compliance costs.

The fourth and fifth impacts of the ETS on the gentailers are its implications for changes in these firms' generation and retailing strategies. Estimates from the Ministry of Economic Development (MED 2007) suggest that carbon pricing will result in renewables being more cost-competitive than fossil fuels in the medium term, and even cheaper than gas-fired generation in the longer term as emissions price rises towards \$50/ton CO_2-e (New Zealand Government 2007c). Thus in the long term, the ETS will provide an incentive for firms to replace old high-emitting technologies and facilities with lower-emitting ones and make a greater use of renewables in generation of electricity (Inter-governmental Panel on Climate Change 2007). In the short and medium term, firms are likely to encourage consumers to lower their electricity consumption and have more energy-efficient and CO_2 sensitive homes so as to lessen the pressure on generation and increase the number of carbon credits available to cover the firms' emissions.

A sixth potential internal change for the electricity gentailers, introduced by the ETS, is the integration between environmental and economic management. The price and trading mechanisms of the ETS mean that electricity generators will need to manage their emissions level (and credits) within traditional financial considerations. Consequently, environmental and economic management needs to be combined, or coupled into an integrated system. Such integration is necessary if PMS monitoring of the deficit/surplus between a firm's available carbon credits and its total emissions and the effective management of its carbon-credit exposure is to be achieved.

In addition to influencing the internal dynamics of electricity generators, the adoption of the ETS is likely to affect gentailers external environmental factors. Firstly, the ETS gives rise to increases in fuel-related uncertainties and risks. There is increased uncertainty regarding the availability and economies of the energy sources. The use of fossil fuels will likely be more expensive due to the need to surrender emission units to cover the emissions caused by their use.

Secondly, electricity generators are now exposed to fluctuations in the prices of emissions. For the net sellers of the carbon credits (TrustPower and Meridian), an increase in emissions prices will potentially bring them profitability gains. In contrast, the thermal-based generators (Contact, Genesis, and to a degree, MRP) are likely to suffer a profitability loss when confronted by such a price increase.

Thirdly, the introduction of the ETS is likely to change the competition dynamics in the retail markets. Table 3 suggests that renewable-based generators will generally be more price-competitive than the thermal-based generators because of lower emissions. Furthermore, renewable-based generators have an advantage in pursuing the image of a "clean and green" electricity supplier. Since consumers and society in general are becoming increasingly aware of sustainability and climate change issues, such a positive image may be one of, if not the key factor, in market competition.

Fourthly, electricity gentailers are subjected to increased regulatory uncertainties due to the introduction of the ETS. Currently there remain debates around the appropriate design of the ETS, especially regarding the mechanism of carbon credit allocation. A new Bill has recently been tabled in Parliament (February 2008) which focuses on the design of the ETS on a nation-wide level. There have been a number of submissions from different organisations that argue the advantages and disadvantages in the ETS design, including submissions from the electricity gentailers (Bill 187-1). In addition, high uncertainties are perceived in relation to which reporting and monitoring requirements will be mandated and the potential future changes of such requirements. In summary, the risks arising from the enforcement of the ETS for electricity gentailers are both internal and external, as illustrated in Table 4 on the next page.

Table 4 assigns two indicators to each of the ETS-related environmental factors. The first indicator is *risk/impact*, which refers to the extent that a particular risk influences a firm's performance. The second indicator, *control*, refers to a firm's ability to manage and mitigate the risk. It is assumed that the external risks are, to a large extent, uncontrollable by the firms and the internal factors are assumed to be within managerial discretion. Each indicator is assigned one of the three levels of ETS impact: low (L), medium (M), or high (H). For example, Meridian and TrustPower, being renewable-based, are exposed to low impacts by increases in thermal fuel prices, and they also have low control over those prices. Table 4 illustrates that the main differences between the gentailers relate to fuel choices for electricity generation. Meridian and TrustPower, being totally renewable-based generators, are insignificantly affected by the ETS in terms of fossil fuels prices and production costs. They are also likely to be net sellers of emissions units and have less competition risk in both wholesale and retail markets under the ETS's mechanisms.

The sources and types of risk that the New Zealand gentailers are currently exposed to, and will be exposed to post-ETS implementation, are driven by the external business environment and need to be managed within the internal operating environments of the respective organisations. Any changes in these external and internal environmental factors are likely to trigger a need for appropriate organisational adaptations and adjustments in the gentailers' strategies and PMS design, function, and operations.

Risk factor	Contact	Genesis	MRP	Meridian	TrustPower
ETS-RELATED RISKS					
ETS risks related to the internal environment					
Emissions units	Buyer	Buyer	Buyer	Seller	Seller
Production costs *(due to increases in emissions costs)*					
Impact	H	H	M	L	L
Control	M	M	M	M	M
Profitability (see Table 3)					
Risk	H (negative)	H (negative)	M (negative)	L (positive)	M (negative)
Control	M	M	M	M	M
Compliance costs *(with the ETS requirements)*					
Risk/Impact	H	H	H	H	H
Control	L	L	L	L	L
Generation strategy (*Through impacts on fuel prices and economies of fuel alternatives)*					
Risk/Impact	H	H	M	L	L
Control	H	H	H	H	H
Retailing strategy (*Move to low-emitting homes and electricity usage efficiency)*					
Risk/Impact	H	H	M	L	L
Control	H	H	H	H	H
Economic & Environmental Management Integration					
Risk/Impact	H	H	H	H	H
Control	H	H	H	H	H
ETS risks related to the external environment					
Higher (thermal) fuel prices					
Risk/Impact	H	H	M	L	L
Control	L	L	L	L	L
ETS market trading risks *(fluctuation in the prices of emissions)*					
Risk/Impact	H (negative)	H (negative)	M (negative)	H (positive)	H (positive)
Control	L	L	L	L	L
Competition *(potential move towards competition for the image of a 'green and clean' electricity supplier*					
Risk/Impact	H	H	M	L	L
Control	M	M	M	M	M
Regulatory uncertainties *(regarding ETS design and reporting requirements)*					
Risk/Impact	H	H	H	H	H
Control	L	L	L	L	L
Key					
L: Low, M: medium, H: low (used to imply the level of impact that an ETS-related risk has on a firm or the level of control that a firm has on that risk)					

Table 4: External and Internal Risks as a Result of the ETS's Introduction for New Zealand Electricity Gentailers

The level of environmental uncertainty and risk experienced by New Zealand gentailers requires a theory which can assist in explaining the implications of those factors for PMS design, function and operations. Additionally, the variety and diversity of potential drivers of PMS change require the adoption of a theory that has a wide coverage in identifying and defining significant environmental factors influencing PMS change. Such a theory should be able to capture the characteristics of both internal and external environments, not least to avoid the issue of omitted variables. The choice of theory and corresponding theoretical framework are discussed in the next two sections, starting with the theoretical development section.

THEORETICAL DEVELOPMENT

Contingency Theory

Contingency theory is arguably the most applicable theory that allows the investigation of multiple economic factors that affect organisational PMS. Contingency theory focuses on a view of uncertainty looking from inside the organisation out. The essence of contingency theory is the notion of 'fit'. It assumes that organisational effectiveness depends on the degree of matching between a firm's internal characteristics with contingencies that reflect the economic and technical situation in which the firm operates (Chandler 1962, Donaldson 2001). When a firm's contingencies change, it results in a misfit between the firm and its contingencies, which in turn leads to a loss of performance. Due to this performance loss, organisations are motivated to restore the fit by changing their internal arrangements in accordance with the new levels of contingencies (Donaldson 2001). Prior contingency-based research provides substantial empirical evidence that organisational MCSs are structured and used differently under the varying levels of environmental uncertainty (Chapman 1997, Hartmann & Moers 1999 & 2003, Chenhall 2003, Chenhall & Chapman 2005). It also assumes that MCS has a role in reducing and managing such environmental uncertainty through increasing the information provided and information-processing capacity (Galbraith 1973).[5]

In an environment characterised by different kinds of internal and external risks such as that of the New Zealand Electricity Industry (NZEI), maintaining an organisation's fit with its operating environments is key to organisational survival and growth. Therefore, when significant environmental changes in the NZEI occur, it is critical that the New Zealand electricity gentailers

[5] Existing information system may be problematic since the existing knowledge and practices are no longer fit or sufficient to resolve the challenges arising from the new environmental uncertainty. Increasing information-processing capacity, for example, designing more performance measures or assigning more people to the PMS, may not be able to solve the problem. Instead, a different approach/ perspective may need to be taken that transforms the knowledge and interests among the people involved in order to effectively manage the uncertainty (see Carlile, 2002, 2004). One example of such transformation is a revision of organisational objectives and strategies which in turn require appropriate cultural, structural and PMS changes in order to respond to the challenges and opportunities that the ETS imposes on the firm.

adapt their PMS accordingly. The introduction of the ETS involves and results in significant changes in many factors traditionally considered contingencies of organisational structures and MCS: the environment, competition, regulation, technology, and firm strategy. These changes, in turn, lead to additional and increased economic risks that need to be effectively managed if the gentailers are tocontinue to perform.

PMS change, in this sense, is essentially a result of changing economic pressures/tensions and an internal adaptation to fit the changes in an organisation's environments. Consequently, an investigation of PMS change in the context of the ETS being introduced into the NZEI and resulting in potential increases in electricity gentailers' environmental uncertainties supports the adoption of a contingency approach. Contingency theory, as an economic approach, enables an explanation of the sources and drivers of PMS changes and thus is best-suited for the purpose of this study.

Contingency-based Risk Management

In addition to the role of PMS in strategy implementation and control (Otley 1999, Simons, Davila & Kaplan 2000, Chapman 2005), the PMS provides an organisation with the basis to manage, control and mitigate business risk exposure in optimizing firm performance and profitability. This is because the PMS is designed to capture information based on identified key indicators for monitoring significant organisational risks and uncertainties as well as organisational performance in managing those risks and uncertainties.

Risk management is about the mitigation of internal and external business risks that may otherwise negatively affect firm performance and survival (Crockford 1986, Alexander & Sheedy 2004) and reducing these risks to a level that is acceptable to the business (Bowden, Lane & Martin 2001). A risk management system (RMS) requires that a firm's internal and external environments be screened so that plans and systems can be formulated for effective risk management (AS/NZS 4360: 2004). This essentially aligns with the assumption of the contingency-based management control research that management control system (MCS) design and use needs to match a firm's operating contexts so as to optimize performance (Otley 1999, Chenhall 2003). The risk management process, or planning framework, as shown in Figure 1, outlines the necessary steps involved in risk assessment and mitigation.

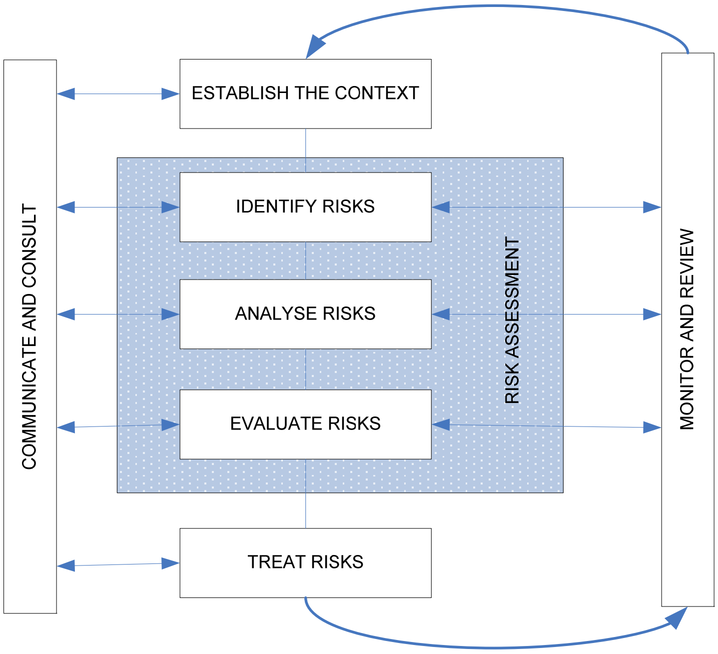

Figure 1: Risk Management Planning Framework (AS/NZS 4360: 2004, p.9)

A comparison between the contingency-based PMS framework of Otley (1999) and the widely accepted risk management system (RMS) framework of AS/NZS 4360 (figure 1) highlights the contingency nature of risk management framework in the literature. Both frameworks encourage a holistic view of the organisation. A contemporary PMS requires viewing the organisation from multiple organisational objectives and stakeholders' perspectives (Kaplan & Norton 1992 & 1996, Bourne, Neely, Mills, & Platts 2003), while a RMS requires an assessment of enterprise-wide risks (Whorter, Matherly & Frizzell 2006). Additionally, PMS and RMS support a linkage to firm strategy (Kaplan & Norton 1992, Neely *et al* 1995 & 2005, AS/NZS 4360). Furthermore, the mechanisms of PMS and RMS facilitate the communication of firm strategy and objectives to the lower levels of management and employees (Otley 1999, Simons, Dávila, & Kaplan 2000, Chapman 2005, Whorter *et al* 2006).

From a process perspective, the steps involved in Otley's (1999) contingency-based performance management framework and the AS/NZS 4360's Risk Management Planning framework are also significantly similar. These similarities are presented in Table 5.

Performance Management Framework (Otley 1999) (summarized)	Risk Management Planning (AS/NZS 4360)
1. Identify key organisational objectives	1. Identify organisational context and evaluate existing practices and needs
2. Determine strategies and plans and key performance measures/indicators	2. Develop risk management plans
3. Determine performance targets/ desired performance levels	3. Ensure support of senior management
4. Set rewards (penalties) associated with the achievement of performance targets	4. Develop and communicate the risk management policy (including link between the policy and firm strategic plans)
5. Design the information flows to enable monitoring and review and corrective action when necessary	5. Establish accountability and authority (including setting performance indicators and associated compensation system)
	6. Customize the risk management process (to organisational context)
	7. Ensure adequate resources (financial and human resources and information systems)

Table 5: Comparison between Performance Management Framework (Otley 1999) and Risk Management Planning Processes (AS/NZS 4360)

There are similarities in Steps 1 and 2 of the two frameworks relating to the assessment of an organisation's environments and the development of strategy-based risk management plans. In Steps 3 and 4 of the performance management framework, the focus is on the setting of performance targets and linking them to the reward system so as to motivate the achievement of those targets, which are part of Step 5 of risk management planning. Another similarity between the two frameworks is the development of an effective information and feedback system, as reflected in Step 5 of the performance management framework and Steps 4 and 7 of risk management planning.

Contingency-based PMS change for effective risk management

This study integrates the theoretical insights of contingency theory into the AS/NZS 4360: 2004 Risk Management Planning Framework. Otley's contingency-based performance management framework has been used to investigate the design and use of organisational PMS in alignment with organisational objectives and strategies. This paper, however, employs a different focus from Otley's performance management framework by linking the design and use of PMS to the external and internal organisational environments. This linkage is achieved by the use of risk as the measure of degrees of environmental uncertainty so as to capture the significance of the impact an organisation's environments may impose on its internal PMS.

The use of a risk management process framework to investigate PMS change is also necessary because it provides a means of assessing changes in the degree of risk exposure, on a common basis across all gentailers, that allows assessment of the required changes in internal control systems (including the PMS) that are necessary to manage and mitigate the risks inherent in an organisation's operating environments.

The aim of this paper is to investigate PMS change in the NZEI which is characterized by traditional market and industry risks and ETS-related risks (as provided in tables 1-4). The investigation of PMS change in such a high-risk environment cannot be adequately conducted without the consideration of risk management implications for PMS design and use. The relationships between the introduction of the ETS, external and internal environments, PMS and performance of New Zealand electricity gentailers are summarised in Figure 2.

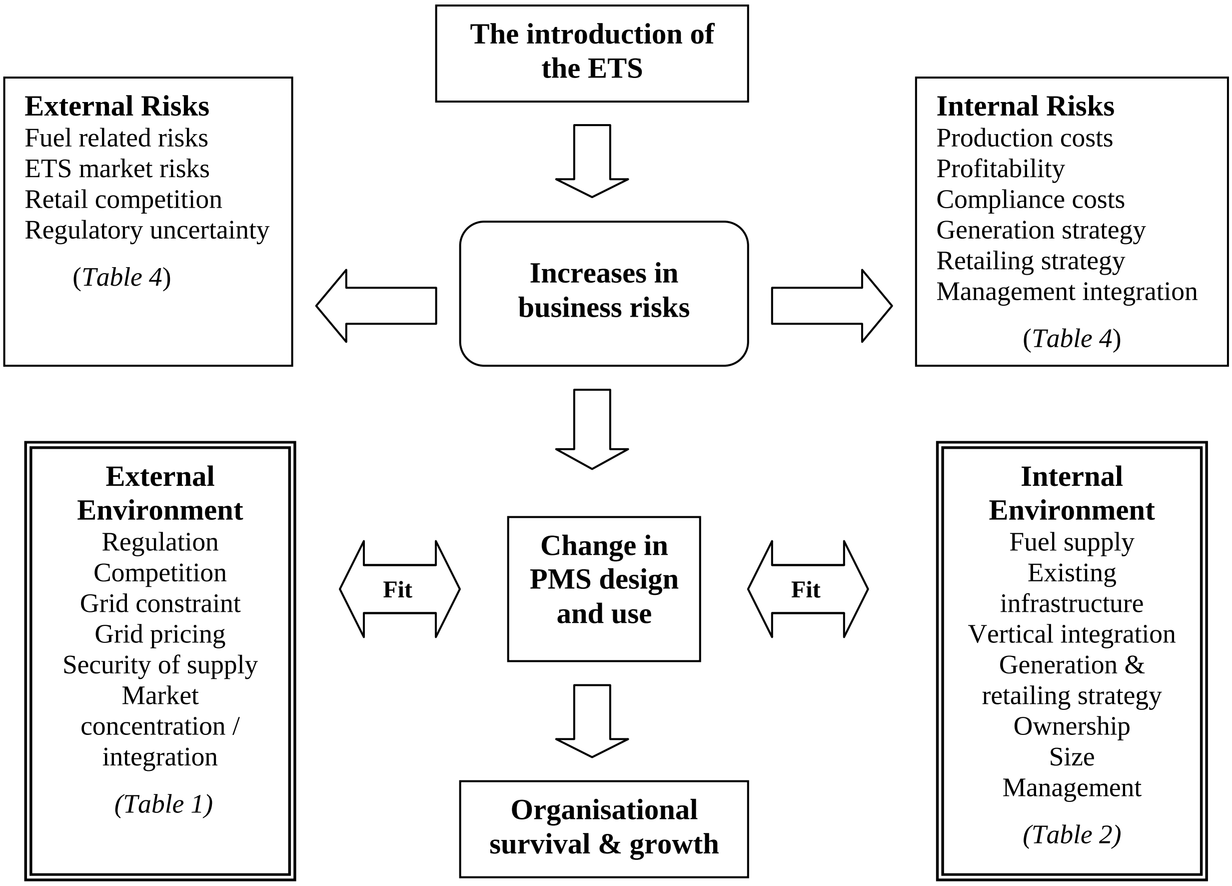

Figure 2: A Summary of the Relationships between ETS Introduction, Operating Environments, and New Zealand Electricity Gentailers' PMS

Figure 2 is a representation of the impact of the ETS on an organisation's PMS through an increase in the external business risk. This increase in external business risk exposure leads to a need for PMS change in order to restore the level of fit with the internal and external environments required to optimize organisational performance.

The application of contingency theory to a risk management framework to explain organisational PMS change in a carbon-constrained operating environment enables a theoretical framework to be constructed. The framework is outlined and discussed in the next section.

A RISK-FOCUSED PMS CHANGE PLANNING FRAMEWORK

Integrating contingency perspectives (as discussed above) into the AS/NZS 4360: 2004 risk management planning framework (Figure 1) has allowed a theoretical framework to be developed that explains PMS change under the introduction of the ETS in the NZEI. Confronted by external and internal ETS-related risks (Table 4), New Zealand electricity gentailers need to change their organisational PMS. A risk responsive framework that would facilitate that PMS change at an organisational level is presented in Figure 3.

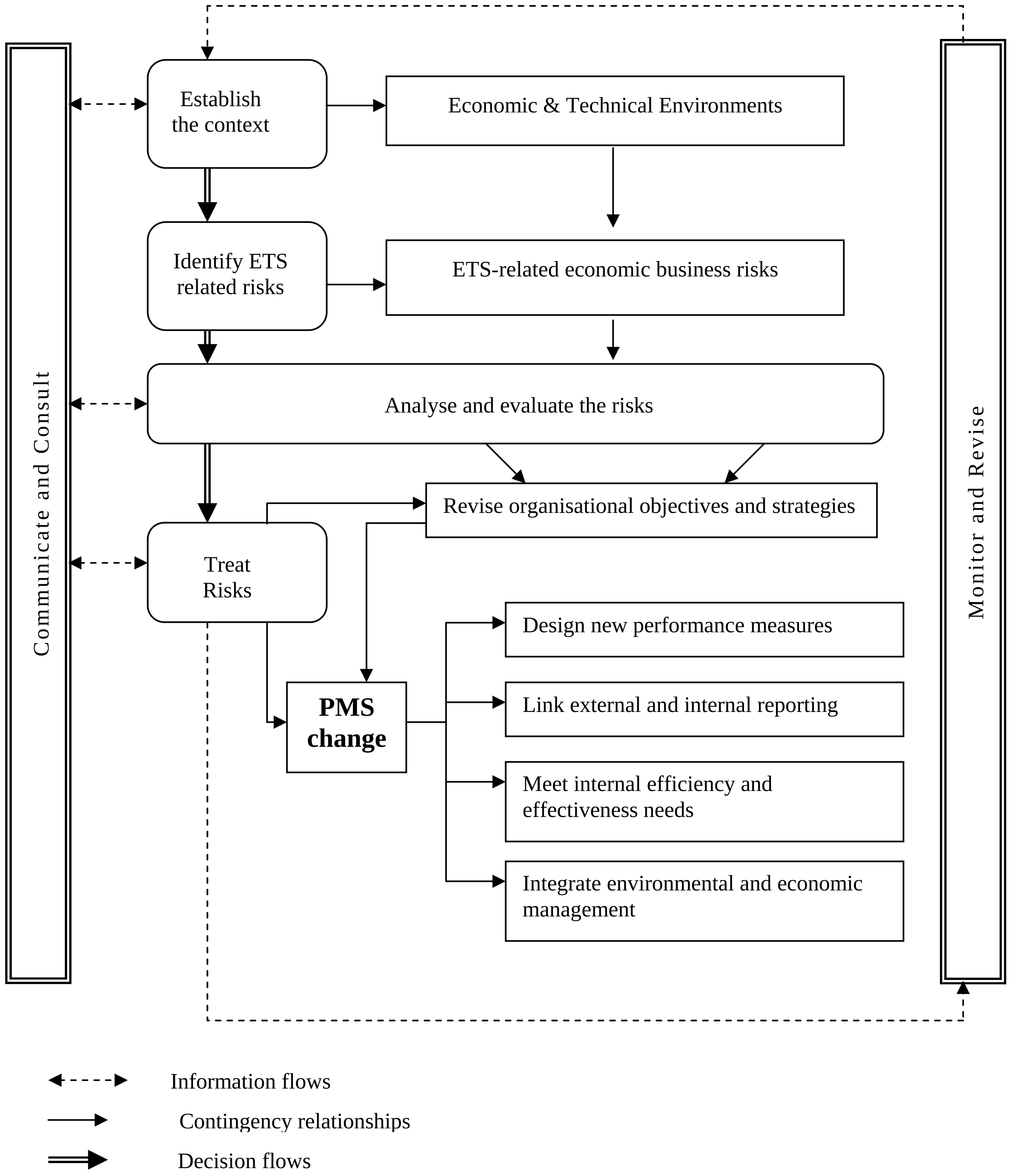

Figure 3: An ETS Risk-focused PMS Change Planning Framework
(Note: The arrows only indicate the direction of the flow, not the expected size)

On the left side of the framework (as indicated by the) are the steps involved in the AS/NZS 4360: 2004. Each of these steps correspond to one level of assessment/action required to enable effective PMS change in response to increased business risks due to the introduction of the ETS.

At the first level, the (senior) management examines the wider environments to understand the context in which the firm operates. Contingency theory suggests that such examination includes the economic and technical elements of the firm's operating environments including competition, regulation, and technology.

At the second level of assessment, the ETS-related risks are identified and can be either internal or external to the firm. This level of assessment should also allow the identification of the differences across the gentailers in the risk environment due to the introduction of the ETS. As will be demonstrated in Tables 6 and 7 (below), the ETS leads to further differentiation between the gentailers in the level of risk exposure to their external and internal operating environments.

At the third level of assessment, each of the ETS-related risks is evaluated so that its potential impacts on the firm are understood and the needs for strategy and PMS change are identified. It is at this level that the ETS-related risks interact with the external and internal environmental factors to bring about and influence PMS change. Table 6 (a summary of tables 1 to 4) identifies the potential external and internal drivers of PMS change. Table 7 builds on Table 6 and demonstrates how these drivers interact to drive potential changes in firm strategies. A risk management perspective suggests that an increase in firm business risks need to be mitigated by appropriate control plans and systems. The gentailers that are negatively exposed to the ETS-related risks due to their internal environment's characteristics (e.g. fuel choices, the level of balance between generation capacity and retailing bases) are therefore likely to undertake more significant strategy and PMS changes. Generally, the third level of assessment is required to gain an understanding of the inter-relationships between ETS-related risks and external and internal environmental factors in determining the scope of strategy and PMS changes required to enable effective risk monitoring and management.

The ETS-related risks are treated in the fourth level of the planning framework, where specific changes in firm strategy and PMS are determined and implemented. Five component assessments are required in this level. Firstly, the firm's objectives and strategies may need to be revised to respond to the increased firm business risks. The other four assessments relate to the required changes in PMS design, functions and operations, whether with or without a strategy change. New performance measures will need to be designed to enable effective management of ETS-related risks. Furthermore, the ETS may result in the PMS being used more for external reporting in addition to internal reporting purposes. In doing so, the PMS serve both internal efficiency and effectiveness needs. Finally, the modified PMS can provide a mechanism to better integrate environmental with economic management.

METHODOLOGY

The theoretical framework developed in Figure 3 and explained above can be applied in practice to examine the drivers and attributes on PMS change in New Zealand electricity gentailers in an ETS carbon-constrained environment. As well as being used above to aid in framework development, secondary data relating to the five predominant gentailers, that comprise 91% and 95% of power generation and retailing segments respectively, is used to test the implications of ETS risks for PMS design, function and operational choice.

RESULTS – APPLYING THE FRAMEWORK TO NEW ZEALAND ELECTRICITY GENTAILERS

The Impact of ETS-Related Risks on the Gentailers

Contingency theory explains that firms, in planning for their survival and growth, choose and implement a PMS that allows the monitoring of internal efficiency and external business risks. The changes and the reforms that have been occurring in the NZEI over the last twenty years, and in particular, the imminent enforcement of the ETS, have increased the internal and external risk exposure for all of the New Zealand electricity gentailers. Table 6 combines the external and internal risks and challenges presented in Tables 1 and 2 and those introduced by the ETS in Table 4 to represent the risk environment in which New Zealand electricity gentailers are operating and upon which the design and use of organisational PMS are contingent. Table 6 (below) shows that prior to the introduction of the ETS, the electricity gentailers had a similar level of external risk exposure. The only difference relates to the HVDC's pricing, which disadvantages South Island generators over North Island ones. However, the gentailers significantly differ from each other in the risks associated with their internal environment.

The environmental differences between the gentailers increase with the introduction of the ETS. Under the ETS, each gentailer is now confronted by a differentiated external environment, in contrast to a relatively homogenous pre-ETS environment. Meridian and TrustPower are likely to be less exposed to fossil fuel increases and carbon-credit market volatility than the thermal-based generators. Internally, Meridian and TrustPower are likely to be net sellers of carbon credits and also have their production costs, generation and retailing strategies less affected by the introduction of the ETS. Their profitability is also less negatively influenced by the ETS than the thermal generators. However, due to being net wholesale buyer, Trust Power's profitability is more exposed than Meridian's when wholesale electricity prices rise due to increases in fossil fuel costs.

Risk factor	Contact	Genesis	MRP	Meridian	TrustPower
Impact of the risks related to the external environment					
Location	NI + SI	NI	NI	SI	NI + SI
Regulation	H	H	H	H	H
Grid constraints	H	H	H	H	H
Grid pricing (HVDC)	H	L	L	H	H
Market concentration and vertical integration	H	H	H	H	H
Competition	H	H	H	H	H
Security of electricity supply (SoS) – national impact	H	H	H	H	H
Impact of the risks related to the internal environment					
Security of fuel supply	H	H	H	H	H
Current focus	Gas Hydro Geothermal	Coal+gas Hydro Cogeneration	Hydro Cogeneration Geothermal	Hydro Wind	Hydro Wind
Future investment	Gas Geothermal Gas exploration	Gas Gas exploration Wind	Wind	Wind Hydro	Wind
Existing infrastructure (Generation plants)					
Location	NI + SI	NI	NI	NI + SI	NI + SI
Carbon emissions	H	H	M	L	L
Vertical integration (as a risk management strategy)					
Trading risks	H	nd	M	nd	H
Retailing strategy	Usage efficiency	Choice + Flexibility +Usage efficiency	Service + Price	Price	Brand + Differentiation + Customer service
Ownership					
Type	Listed	SOE	SOE	SOE	Listed
Market discipline	H	L	L	L	H
Finance risks	H	M	M	M	H
External reporting requirements	NZIFRS NZX	SOE Act, Companies Act, Financial Reporting Act, Statement of Corporate Intent			NZIFRS NZX
ETS-RELATED RISKS					
Impact of ETS risks related to the internal environment					
Emissions units	Buyer	Buyer	Buyer	Seller	Seller
Production costs	H	H	M	L	L
Profitability	H (negative)	H (negative)	M (negative)	L (positive)	M (negative)
Compliance costs	H	H	H	H	H
Generation strategy	H	H	M	L	L
Retailing strategy	H	H	M	L	L
Eco. & Envi. Mana. Integration	H	H	H	H	H
Impacts of ETS risks related to the external environment					
Higher fuel prices	H	H	M	L	L
ETS market risks (negative/ positive)	H (negative)	H (negative)	M (negative)	H (positive)	H (positive)
Retail competition	H	H	M	L	L
Regulatory uncertainties	H	H	H	H	H

Table 6: The Major Risks Characterising the Internal and External Environments of New Zealand Electricity Gentailers

The implications of Table 6 for electricity gentailers are further understood by using the secondary data-based analysis presented in Table 7.

	Contact Jun-07	Genesis Jun-07	MRP Jun-07	Meridian Jun-07	Trustpower Jun-07
Thermal-based generation (%)	65%	68%	28%	0%	0%
Wholesale market share 2007					
Gwh	11020	7991	4973.3	12679	1941
(%)	28.5%	20.7%	12.9%	32.8%	5.0%
Retail market share (ICP) (%)	27.4%	29.2%	17.9%	11.5%	11.7%
Emissions from generation (ktCO2)					
ktCO2	2477	5100	384	0	0
%	31.1%	64.1%	4.8%	0.0%	0.0%
Emissions intensity (tCO2/Gwh)	336	803	337	0	0
Total assets (million $)	4972	2182	2882	6668	2060
Generation assets (million$)	4027	1502	2233	6129	1220
Generation assets/fixed assets	89%	81%	86%	96%	64%
Emissions intensity (tCO2/million$ gene.asset)	615	3395	172	0	0
Operating expenses (million $)	1454	1668	461	1415	430
Emissions cost (assuming 30$/tCO2) (million $)	74	153	12	0	0
Emisisons costs/operating expenses	**5.1%**	**9.2%**	**2.5%**	**0.0%**	**0.0%**
Emisisons costs/operating expenses (at 50$/tCO2 emissions price)	8.5%	15.3%	4.2%	0.0%	0.0%
Average retail charge (May 05 - May 07) ($/Mwh)	209.7	202.8	203.8	203.0	219.3
Gwh Sold	7564	5682	3911	5471	4575
Retail charge ranking (1- most expensive)	**2**	**5**	**3**	**4**	**1**
Wholesale price ($/Mwh)	53.7	52.2	55.7	51.0	52.2
Gwh generated	11020	7991	4973.3	12679	1941
Required increase in retail price ($/Mwh)	9.82	26.93	2.94	0.00	0.00
Required retail price to maintain current level of profit ($/Mwh)	**219.6**	**229.7**	**206.7**	**203.0**	**219.3**
Retail charge ranking (1- most expensive)	**2**	**1**	**4**	**5**	**3**

Table 7: Wholesale and Retailing Competition and ETS's Introduction[6]

Table 7 demonstrates how external factors interact with internal factors to influence a gentailer's strategies, operations, and activities. The impacts that a carbon-charge (an external factor) exerts on a firm's retailing and generation strategies depends on the generation portfolio (proportion of thermal generation in total generation capacity), the balance of integration between generation and retailing (net seller/net buyer), the existing wholesale and retail market shares, the

[6] Information for this table was obtained from various reports of the sample organisations

location and distribution of the retailing networks, and the emission intensity and efficiency of the existing generating plants, and the cost structure of each gentailer.

From Table 7 it can be seen that Genesis currently has the highest proportion of thermal-based generation in their total generation capacity, followed by Contact and MRP. The emissions intensity from the generation activities of Genesis is also the highest among all the generators. Its average retailing charge, in 2007, however, ranks the lowest among all the retailers, making Genesis one of the most price-competitive on the market. The introduction of the ETS will change the competition landscape significantly. Assuming an emissions price of 30$/ton[7] CO_2-e, total emissions costs incurred by Genesis, Contact and MRP at 2007 emissions level are, respectively, 153, 74 and 12 million NZ$. At this emissions price, emissions costs account for 9.2%, 5.1%, and 2.5% of their respective total operating costs. If emissions price was to increase to 50$/ton CO_2-e, the proportion of emissions costs to total operating costs for each of the thermal generators rises to 15.3%, 8.5% and 4.2% for each of these firms. A price of 50$/ton CO_2-e is not unrealistic given that EU emissions credits currently are priced at €22 (NZ$44).

In order to maintain the same profits as that of 2007, assuming the same level of production, wholesale and retail sales and 30$/ton CO_2-e, the thermal generators (Genesis, Contact and MRP) have to increase their retail charge to $229 (+$17), $219 (+$10) and $206 (+$3) per Mwh respectively. However, Meridian and TrustPower are able to maintain the current charges (203$ and 219$ per Mwh). This makes Genesis, on average, the most expensive retailer, followed by Contact and TrustPower. TrustPower, from being the most expensive retailer becomes the third cheapest under this scenario. Moreover, looking at the distribution of retailing networks by each gentailer (Appendix A) Genesis is likely to face the most intense competition from MRP and Meridian, the latter currently being the biggest net wholesale sellers. With the carbon charge, MRP and Meridian become more price competitive than Genesis in the same retailing networks; an advantage that they can utilize to gain additional retail market share. Using a similar lens, Meridian is likely to become the immediate price-competitor to Contact, who is the second most disadvantaged in terms of retail charge under the scenario presented in Table 7.

Table 7 clearly demonstrates that the proposed introduction of the ETS will significantly change the state of retail competition for all the gentailers. The ETS not only alters the price competitiveness of each gentailer but also is likely to influence the retailing strategy employed by each firm to maintain (e.g., for Contact and Genesis) or increase (e.g. for MRP and Meridian) its market shares. In order to sustain their competitiveness, thermal-based generators need to reduce their emissions intensity to keep down production costs and/or horizontally integrate into industries providing carbon credits (e.g. forests). However, horizontal integration would create

[7] Based on the recently announced price paid by Air New Zealand for their carbon credits.

resource pressure and may only provide short-term relief given that those investments also need to yield a return. Emissions intensity reduction can also be achieved through increasing renewable-based generation capacity and/or employing advanced technologies to improve production efficiency. The focus on renewables, however, also means a reduction in security of electricity supply due to the instability in the supply of renewables (e.g. wind and lake levels). This may in turn lead to the need to maintain thermal plants as back-up for renewables-based plants. Alternatively, the gentailers may choose to reduce their exposure to the increased uncertain electricity spot and retail markets due to the emission trading obligation by increasing the integration between their generation and retailing capacities.

The analyses above show the internal and external ETS risks are likely to lead to changes in generation, retailing and diversification strategies of the gentailers, in particular, the thermal-based gentailers. Such strategy renewals in turn require corresponding changes in organisational PMS. Such PMS changes are needed to ensure effective monitoring of critical business risks arising from the ETS implementation as well as to realize the changes in firm strategies resulting from the pressures of the ETS on these firms' economic performance (e.g. profitability) and hence their continued survival and growth.

Potential Drivers and Attributes of Strategy and PMS Change

Based on the risk-focused PMS change planning framework (Figure 3) and the analyses conducted above and summarized in Tables 6 and 7, a number of potential drivers and attributes of strategy and PMS change can be identified. Externally, increases in fossil fuel costs, volatility of carbon credits/emissions prices, high compliance costs and increased concern of climate change are the factors that have the greatest capacity to drive a gentailer's strategy and PMS change. Internally, strategy and PMS changes are likely to be driven by increases in production costs and reduction in profitability, existing generation strategy (in particular the proportion of thermal-based generation in total capacity), the level of vertical integration (balance between generation and retailing bases), retailing strategy and locations, the efficiency of existing generation plants (emissions intensity) and any horizontal integration strategy to gain carbon-credit off-sets.

Under the pressures of these drivers, the gentailers are likely to revise their strategies in order to incorporate and emphasize the need for emissions management. This emphasis helps channel the firm's internal efforts towards managing emissions-related costs and liabilities and, in doing so, simultaneously achieving financial control and environmental management. The gentailers retailing strategies also need to be revised if they are to maintain their competitiveness. Firms that are less price competitive due to their dependence on fossil fuels for generation will need to focus their retailing strategies on types of competition other than price competition since their emissions intensity (and thus production cost) is unlikely to be significantly reduced in the short term to avoid the potential retail price increases. Simultaneously, they might also lobby governments and regulators for structural adjustment support by way of greater initial allocation of carbon credits in recognition of the inherited infrastructure costs. Being a structural adjustment initiative, it is also only a short-term plan. Alternatively, the government may decide to reallocate the structural generation assets between gentailers making a more even playing field between thermal-based and renewable generation capacity.

New Zealand gentailers (from 2006 onwards) are beginning to take differentiated strategic positions regarding their generation and retailing strategies. Thermal-based generators are investing in lower-emitting thermal fuel solutions (gas, geothermal) in replacement of coal-fired plants. Renewables-based generators plan to continue investing in wind and geothermal fields. Additionally, all five gentailers have highlighted their commitment to reducing their emissions and responsiveness to climate change issues through not only generation and retailing activities but also active engagement with various stakeholder groups.

Any changes in gentailer strategies should be matched and realized by corresponding changes in PMS design, functions, and operations. In terms of design, PMS is likely to be multi-dimensional to reflect the multiple organisational objectives and strategies that respond to differing economic and stakeholder pressures in the gentailers' operating environments. It is also probable that new measures need to be designed to monitor ETS-related specific risks, such as the level of emissions from generation and non-generation activities and movements in carbon credit prices. As well, gentailers will probably need to make a greater use of performance measures in external reporting in addition to PMS use for internal reporting purposes. In doing so, PMS serves both effectiveness and efficiency organisational needs. Finally, the incorporation and emphasis on emissions management in PMS facilitates stronger cooperation and coordination between financial control and environmental management functions and departments. These PMS changes are necessary to ensure the achievement of an emissions-focused firm strategy which ultimately aims to improve, or at least maintain, organisational economic and environmental performance. Overall, the PMS implications for the electricity gentailers are for greater PMS sophistication and interaction to fulfil a range of strategies driven by the organisation's generation base. Future research can aim to test to what extent these PMS changes actually occur within the gentailers and the degree to which these changes lead to better organisational performance.

SUMMARY, COMMENTS AND CONCLUSIONS

The primary aim of this paper is to develop a PMS planning framework that explains PMS change in response to changes in an organisation's external business environment and internal operating environments. In doing so, it helps identify the drivers and attributes of PMS change in the New Zealand electricity generation and retailing (gentailers) sector as a consequence of ETS adoption. To this end, this paper has developed a risk-focused PMS change planning framework (Figure 3) through demonstrating how the introduction of the ETS increases the level and changes the structure of the risk exposure experienced by each gentailer in their internal and external environments.

Direct operational implications arising from the PMS change framework development suggest that the predominantly thermal-based generators will be more disadvantaged on ETS implementation. Their production costs will increase, profitability will decrease, and their retailing competitiveness will potentially be impaired when compared to the renewable-based gentailers. Such performance reduction is a result of the interaction between the ETS-related risks and the external and internal environmental characteristics such as the type and condition of existing generation plants, and the level of integration between generation and retailing bases. For these thermal-based gentailers, it suggests that there is a risk that they may impact on their capacity to survive. However, the national issue of security of supply does present a potential survival risk-mitigating consideration. The question that needs to be answered by government and regulators is could the renewable-based generators sustainably meet New Zealand power generation needs? Given that the government has invested in back-up power generation to meet this potential under existing pre-ETS conditions, early loss of thermal-based generation does present a potential for economic loss until such time as the renewable-based generation capacity can be increased to sustainable supply levels.

The differing organisational consequences of internalising an externality (that of emissions and their impacts on the natural environment) relating to the wider environmental management objectives of ETS, raise questions regarding the appropriate design and implementation of the ETS so as to maintain a fair playing field for all the market participants. The analyses suggests that the generators that inherited a strong dependence on fossil fuels for electricity generation during the commercialization of the industry in 1990s are significantly worse off compared to other generators on ETS introduction. There is a need for regulators and government decision-makers to assess whether or not some form of structural adjustment, not least in terms of the carbon-credit basis of allocation, to compensate or not disadvantage those thermal-based gentailers is required. The implementation of the ETS without any free allocation of carbon credits to offset the burden of thermal inheritance may lead to reductions in production levels and serious impairment of these gentailers' competitiveness, which in turn could affect their survival capacity. Alternatively, contingency plans for industry restructure in terms of balancing the management of thermal and renewable generation assets might be considered given the potential competitive survival threats facing thermal generators and the pre-ETS production efficiency of thermal generation over renewable based generation. A consideration that might compliment any restructure or structural adjustment, is that of encouraging thermal based generators to horizontally diversify into carbon additionality/offset projects, if only for the short term.

These organisational consequences further exacerbate the issues surrounding the nation's security of supply and have the potential to lead to negative macro-economic business consequences that could impact on the success of the government's environmental management initiatives. Given these wider regulatory considerations and the preceding PMS considerations at the organisational level, the findings of this analysis are argued to have more than achieved the study's aim.

Central to the study findings is the risk-focused theoretical framework utilising contingency theoretical perspectives developed in this paper. By employing a risk management lens that incorporates the insights from contingency theory, this study has provided a basis for improving the identification, definition, and degree of externally driven uncertainty (change). In doing so, a basis for understanding the organisational contingent implications for PMS design, function, and operation in managing that change and mitigating business risk exposure is achieved. More importantly, the risk management lens provides a basis for within and across organisation comparisons, something that contingency based research has struggled with over time (Chenhall 2003). By using risk as a measure of environmental uncertainty, this study has provided a potential extension to the contingency-based literature.

An additional strength of this study is provided by it being among the first to explore the implications of an ETS driven carbon-constrained operating environment for organisations' performance, strategy and internal control systems. Given the critical importance of understanding organisations' adaptations in a climate change-focused environment, the topic of this paper certainly merits further examination and investigation as does wider testing of the framework developed in this paper.

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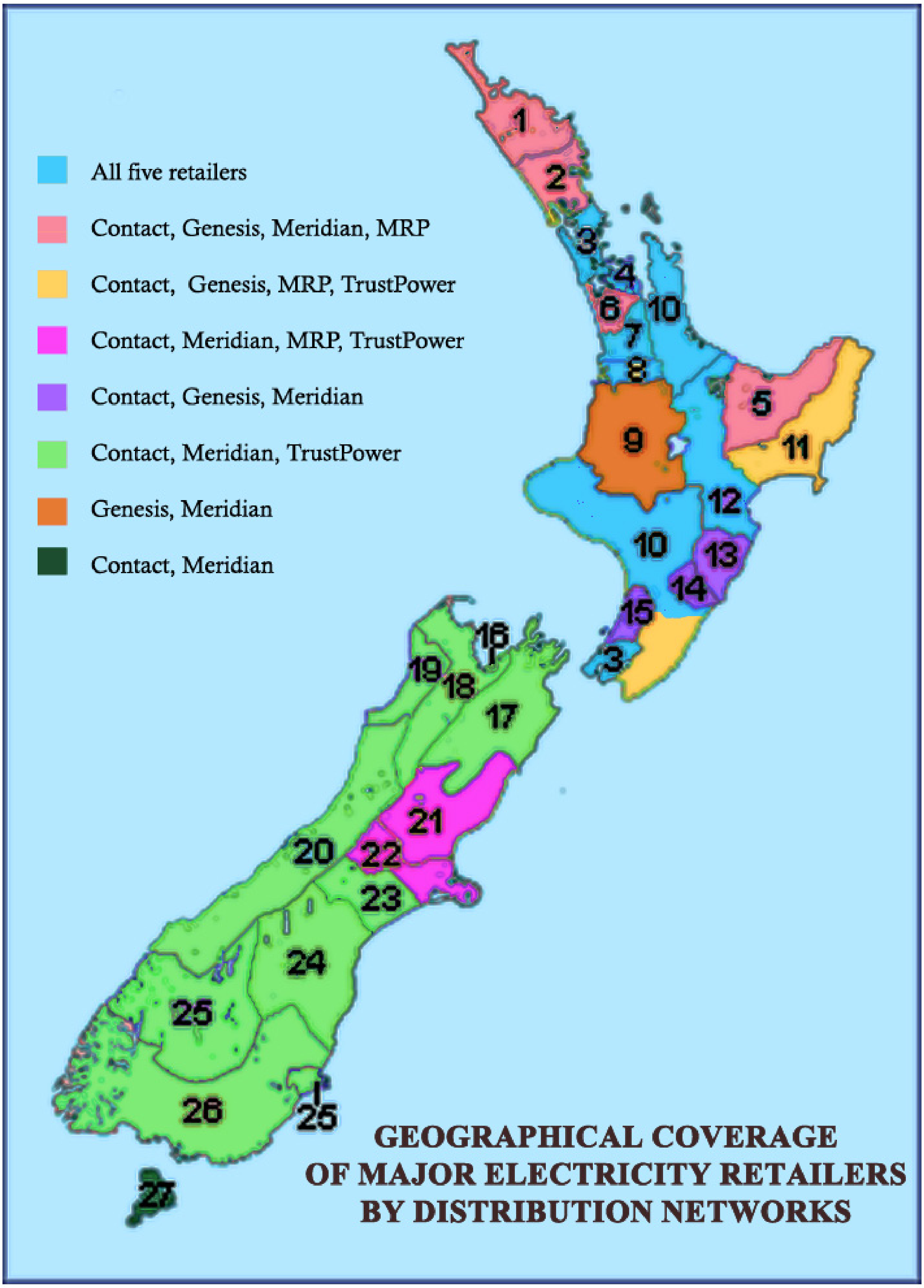

Appendix A: Geographical Coverage of Major Electricity Retailers