Asset Risk Management –
A Key Asset Management Tool

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Abstract

Over the past year Transpower has reviewed and updated its approach to Asset Risk Management. This new approach has included the development of a specific Asset Risk Management policy and process which aligns to Transpower's Corporate Risk Management Policy and Framework.

The Asset Risk Management Policy sets out the governance structure for Asset Risk Management as well as clearly articulating the principles under which the policy operates.

Transpower recognises that managing risk is an essential and critical component of managing its assets effectively. Identifying its asset related business objectives and understanding the risks that need to be managed to achieve those objectives enhances management's ability to make better decisions throughout the lifecycle of assets, protect and enhance the company's reputation and improve its commercial business performance.

Asset Risk Management is an important foundation for the proactive and on-going management of assets. Its overall purpose is to understand the cause, consequence and likelihood of adverse events occurring, to optimally manage such risks to within the corporate risk appetite, and to provide evidence that risks relating to the management of its assets are being well managed. The process also allows for the identification of key mitigations over which assurance can be sought.

As part of our overall Asset Risk Management Framework the following processes are also being developed to align with the Asset Risk Management Policy and Process; Asset Criticality and Asset Heath indices and Tactical Asset Management Plans (AMPs). Tactical AMPs focus on current issues relating to specific assets and are prioritised using a risk based model.

Asset Risk Management provides a structured, efficient and transparent risk management process, incorporating practical business-focused information. Long-term value for our customers will be obtained by:

- identifying unrecognised risks
- regular review of the effectiveness of controls and treatments for identified risks
- more clarity and consistent information for making trade-offs between risks and cost
- developing a risk ranking system, enabling us to prioritise investment to better manage risk.

1 Introduction

A reliable electricity transmission service is essential to sustaining economic and social activity throughout New Zealand. Significant failures of service have major consequences for end consumers, and for society at large. The management of risk is therefore a key driver for Transpower and is an essential and critical component of Transpower's business and asset management practices. Risk management provides critical data and information from which informed business decisions can be made.

There have been major advances in asset management systems thinking and practice in electricity organisations over the past 10 years. Good industry practice in asset management systems is now recognised as being aligned with PAS55-1 (Asset Management) [1] and ISO55001 (Asset management – Management systems – Requirements) [3]. Risk management is a key element of both PAS55-1 and ISO55001. PAS 55-1 specifically requires that [1]:

"The organisation shall establish, implement and maintain documented process(es) or procedure(s) for the on-going identification and assessment of asset-related and asset-management-related risks and the identification and implementation of necessary control measures throughout the life-cycles of the assets."

The PAS55-2, Guide for the application of PAS55-1 goes on to state [2]:

"Risk management is integral to all asset management processes. However, there is specific need to have processes in place to identify and monitor risks, linked to control mechanisms for controlling, mitigating or recording them. It is a legal requirement that safety of employees, third parties and the public is managed to the appropriate legislative standard. … There are further compliance requirements to manage environmental risk and to comply with legislation on corporate and financial risk management.

PAS55-1 recognises the need to integrate the management of risk throughout the asset management system, beyond the requirements of legislation in order to prioritize and optimize activities based on cost, risk and performance. In practice, this extends to the management of business risk and includes long term sustainability."

Despite recognition that Risk Management is a key Asset Management tool the International Transmission (and Distribution) Asset Management Studies (ITAMS [4] and IDAMS [5]) for 2012 found that [4][5] *"Risk Management is perceived as a very difficult topic and a learning area for all participants. … There seems to be a huge gap between corporate risk reported and asset risk reported. Only a few of the participants had filled in the gap between asset risk and corporate risk."* In addition [5] *"Only few of the participating companies take a holistic view of the risk management process - there appears to be a lack of a strong connection between risk analysis, portfolio management, and the prioritization/optimization of CAPEX/OPEX.*

- *Collecting issues/potential risks is not fully developed – it is mainly a financial or high-level risk assessment, that results in projects.*
- *Little proof that a central asset register is used for risk identification.*
- *Portfolio management, prioritization and/or optimization are generally not performed in an aligned and integrated manner."*

If managed on an informal / non-structured basis, which is not aligned with an organisation's corporate risk management processes, Asset Risk Management does not enable robust input from front-line business managers nor allow for the active management of risks. In such circumstances it would also be difficult to see how corporate level risks are linked to those faced and managed at a team level, especially if risk registers at that level are not kept up to date and maintained. If the risk management process adopted does not provide assurance as to the adequacy and effectiveness of controls to mitigate risks, the resultant level of risk within the business could well be understated. It is also important to track treatments to improve the controls over risks that are outside of an organisation's risk appetite to ensure they are complete and effective. By aligning corporate and asset risk management practices, asset risk management becomes an integral part of managing a business (at all levels) and ensures that risk management procedures are fully understood, exercised and add value.

2 Asset Risk Framework within Transpower

Within Transpower, Asset Risk Management is viewed as an important foundation for the proactive and on-going management of assets. Its overall purpose being to understand the cause, consequence and likelihood of adverse events occurring; to optimally manage such risks to within the corporate risk appetite; and to provide evidence that risks relating to the management of assets are being well managed. A robust Asset Risk Management process also allows for the identification of key controls over which assurance can be sought.

Transpower has defined Asset Risk as the "Risks associated with provision of transmission services, asset systems, individual assets and within material business systems, activities and processes". Based on this definition we are currently embedding an Asset Risk Management process that provides "Boiler Room" to "Board Room" line of sight of operational and strategic risks faced by Transpower. To deliver on this we need to ensure that Asset Risk Management is an integral part of managing day to day activities of the company. This entails aligning Asset Risk Management with our Asset Management strategies, objectives and plans (refer Figure 1).

The structure of our Asset Risk Management framework aligns to that of the Asset Management System throughout the various levels of Transpower, from the Operations & Maintenance teams to Board level. Alignment at each level is crucial if the Asset Risk Management framework is to demonstrably assist Transpower to achieve its asset management strategy, objectives and plans.

Our vision is that a fully adopted Asset Risk Management process within Transpower will have achieved and embedded the following key outcomes:

- Risk Management is the responsibility of all Transpower employees to identify and proactively manage risks associated with their roles.
- Asset Risk Management is an integral part of Transpower's grid business organisational arrangements and is not a stand-alone activity which is separate from the main activities and processes.
- Asset Risk Management creates value whilst minimising the risk of loss and contributes to the demonstrable achievement of objectives.
- Asset Risk Management improves strategic planning and is dynamic, iterative and responsive, including successfully responding to a changing business environment.

- Asset Risk Management ensures key decisions within Transpower's grid asset business will be informed by balancing risk with reward and enables prioritisation of risks faced by the business.
- Asset Risk Management improves stakeholder confidence and trust through effective consideration, management and transparent reporting of all significant risks.
- Asset Risk Management provides the tools to facilitate continuous improvement in the way grid assets are managed.

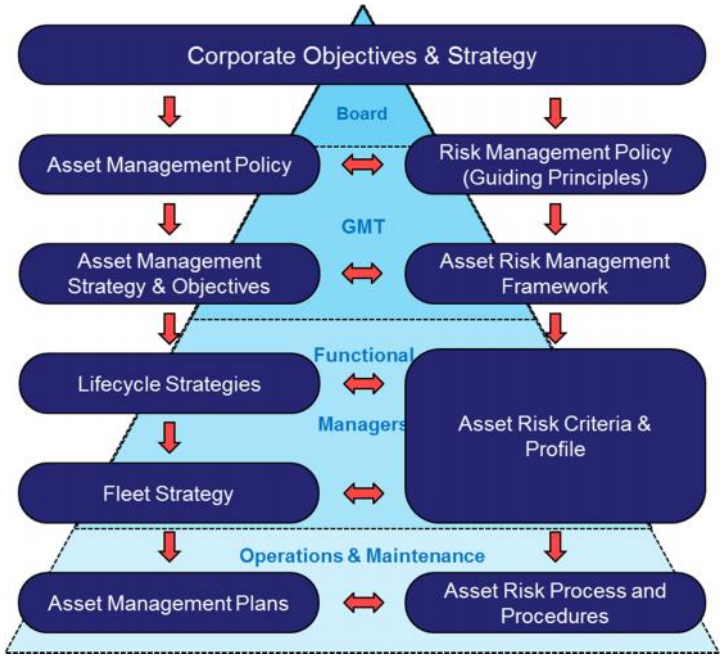

Figure 1: Alignment of Asset Management and Risk Management

3 Establishing Effective Asset Risk Management

In order to bring our vision to life we have embarked on an improvement programme for Asset Risk Management across the grid asset business. The first step has been to write a separate Asset Risk Management Policy which aligns to Transpower's Corporate Risk Policy. Figure 2 illustrates the relationship between the Corporate Risk Management focus and the Asset Risk Management focus and how they interrelate with each other and the wider risks within Transpower. The Asset Risk Policy states the principles under which it operates; the scope of the policy; and the governance framework that applies to it.

The policy also includes reference to the current corporate risk appetite and details of the broad risk categories, as detailed earlier, to be used when classifying risks.

To support the policy an Asset Risk Management Process document has been written and published setting out the six key stages in our asset risk management process. These stages are broadly based on those recommended in the ISO 31000 standard on Risk Management and include the following key steps; establishing the context, risk identification, risk assessment, risk evaluation, risk treatment and risk monitoring & review.

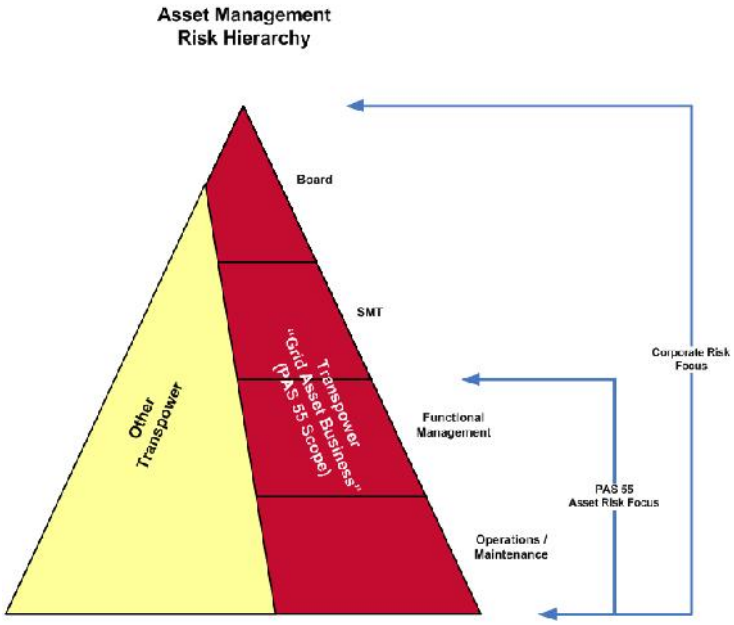

Figure 2: Alignment of Corporate and Asset Risk

To further embed the process into the front line business, a series of workshops covering each of the key stages of the process have been developed. These workshops are being systematically rolled out across the various teams within the grid asset business. A key element of the workshops is to start changing the culture within the organisation in order to make asset risk management (as a formal process) a part of business as usual. To enable this, a decentralised model has been adopted with "Risk Champions" being nominated for each team. The Risk Champion's role is to help facilitate the asset risk management process within their team and to ensure managing asset risks becomes an integral part of business as usual. Each team / region is compiling a risk register of the risks they face in achieving their objectives. These risks are then aggregated at the Divisional level and go through moderating sessions in order to establish the key risks faced by the grid asset business. Risks from this level are then uploaded into the Corporate Risk Register as appropriate in order to provide transparency to Senior Management and the Board.

A fully mature Asset Risk Management Process encompasses the whole asset lifecycle and enables line of sight on key risks to be achieved between the 'boiler room' and 'board room'. It also includes investigations to identify corrective and preventive actions in order to better manage the risks faced by the business.

4 Supporting Tools

In addition to establishing a formal Asset Risk Management Policy and Process, Transpower has also established a suite of tools that actively support and inform Transpower's understanding of its asset risks and its asset management (e.g. expenditure) decisions.

4.1 Asset Health and Criticality

Transpower has developed Asset Health Indices (AHI) for estimating the remaining life of assets. This is defined as the time until an asset intervention is likely to be required to reduce asset-related risk. Asset health is derived using a standard methodology which takes into account the following factors:

- asset condition based on test and inspection results

- predictions of future condition and performance
- fleet failure rate
- model-specific experience
- environmental factors , such as harsh coastal or geothermal environments
- technical experience and expertise.

To date, the AHI methodology has been deployed for three core asset types: transformers, transmission lines, and circuit breakers. Work is underway to expand it to other fleets.

Asset criticality is one of the key elements of our asset risk framework and serves as a proxy for the consequences of failure. We have divided our Grid Points of Service (POS) into different categories based on the criticality of load they supply. This allows a differentiated approach to service levels, design, operation and maintenance. We have also developed a model for translating the criticality of the POS to the criticality of the network branches (and hence individual assets) that supply the connection point.

In combination, asset health and asset criticality can be used to assign an overall risk to our assets. This enables us to prioritise and optimise the timing of asset interventions. This framework has resulted in improvements in the way we quantify, communicate and use asset risk to inform our investment decisions. In addition to managing asset risk, we can use the associated performance measures to target and prioritise our expenditure. This approach continues to mature as new tools and models are developed, tested and used.

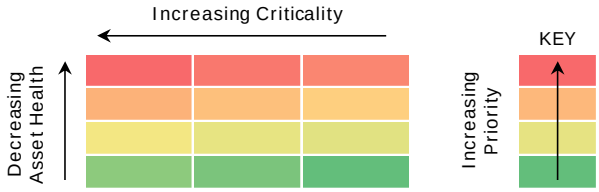

Figure 3: Prioritisation Matrix

4.2 Tactical Asset Management Plans

Transpower's Tactical Asset Management Plan (AMP) process is described in detailed in another EEA 2014 paper titled *Implementation of a Tactical Asset Management Plan for Existing Transmission Assets* [6]. This process identifies issues [6] *"for specific assets using standard reliability engineering techniques: work history analysis, condition assessments, field audits etc. These are validated and risk assessed, and then proposals to resolve the issue are determined along with cost estimates and likely mitigation of risk. The outcome of the plan is formal proposals of work in existing transaction systems such as capital project work or the maintenance system. Other options include investigations and follow up by expert support groups within Transpower such as reliability and asset engineering experts."*

4.3 Maximo HSE

Transpower has also recently enabled the Health, Safety and Environmental (HSE) add-on within its Maximo based Asset Management Information System. This addition enables:

- integrated management of hazards and risk
- improved data quality with more accurate reporting
- reduced data replication

- improved planning for safety, resulting in a safer working environment
- full transparency of corrective actions
- integration with Work Order management.

Hazards are managed in Maximo and are able to be linked to work orders giving better visibility of site hazards when planning work. Corrective actions are also managed In Maximo and mitigate the risk of further incidents. The relationship between the key health and safety components within Maximo is illustrated in Figure 4.

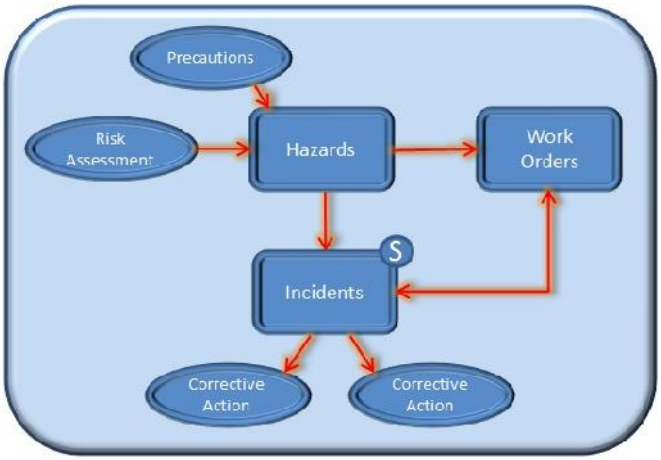

Figure 4: Integrated Management of Hazards, Risks and Corrective Actions

5 Next Steps and Future Improvements

Transpower's risk management systems and processes are currently spreadsheet based and can be difficult and time consuming to manage and maintain. It was also recognised that greater granularity (particularly when assessing major risks) is necessary to make more informed decisions about risk. Following review, an opportunity has been identified to improve the quality, integrity and consistency of Transpower's risk data and to further rationalise the process through the use of modern risk management information systems. The review specifically identified that Transpower consider the use of 'bowtie' and partial or semi-quantitative risk analysis.

Bowtie analysis provides bow-tie like diagrams that enable risks to be readily visualised. These diagrams are easily understood, enabling alignment and direct line of sight throughout the business when it comes to actively managing risks. The power of a Bowtie diagram is that it gives you an overview of multiple plausible scenarios, in a single picture. It provides a simple, visual explanation of a risk that would be much more difficult to explain otherwise.

The Bowtie analyses chains of events, or possible hazard scenarios. A Bowtie is developed in consultation with operators and/or subject matter experts. Due to its structure it analyses the scenario in detail, thereby, ensuing all possible threats or causes are identified along with controls. The structure forces teams to focus on both preventive and corrective measures and, once completed, it will identify gaps in the control framework. Bowties have also proved extremely useful as tools to aid incident investigation teams. Overall, the Bowtie identifies all control and recovery measures that an organisation has in place. This type of thinking aligns with the famous Swiss Cheese model by James Reason, which originated in the early nineties.

Figure 5: Bowtie Diagram [7]

Semi-Quantitative Risk Assessment (SQRA) tools are much less complex than a full Quantitative Risk Assessment (QRA) tools and also enable direct engagement with site personnel to identify and validate actual threats, controls and risks that apply at each the specific facility. Together, these systems provide:

- greater focus on cause and control, and effectiveness of controls
- easier identification of critical controls
- structured risk analysis process with graphical representation
- greater granularity and relativity between risks
- more informed decision making
- a central point of "risk truth".

The introduction of Bowtie and SQRA tools and processes will enable more effective risk management within Transpower. They will create closer linkage, integration and alignment between Transpower's Risk Management system and Safety Management System. Transpower's Risk Management System will become the central point of "risk truth" for both strategic and operational risk including safety and asset related risks. This integration will further enable cost-effective allocation of resources targeted at major hazards and risks.

6 Summary

Transpower has established, and is embedding, an Asset Risk Management Policy and framework which directly aligns with Transpower's Grid Asset Management and Corporate Risk Management Policies and frameworks.

In addition to establishing a formal Asset Risk Management Policy and process, Transpower has also established a suite of tools including Asset Criticality, Asset Health Indices, Tactical Asset Management Plans and a Health, Safety and Environmental add-on to its Asset Management Information System. These tools actively support and inform Transpower's understanding of its asset risks and associated asset management decisions.

These improvements are aimed at providing better organisation-wide insights for enabling better asset management decisions and facilitating continuous improvement in the way grid assets are managed. Asset Risk Management is a key Asset Management tool.

7 Acknowledgements

The authors acknowledge the support of many Transpower managers and personnel who have supported the development of Transpower's asset risk management framework and process.

8 References

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