Advisory Group

Supply Reliability Risk Management

26 April 2012

Note: This paper has been prepared for the purpose of SRC discussions. Content should not be interpreted as representing the views or policy of the Electricity Authority.

Purpose

1. The Security and Reliability Council (SRC) has been appointed, in accordance with the Electricity Industry Act 2010 (Act), to provide independent advice to the Electricity Authority (Authority) on:

    a) the performance of the electricity system and the system operator; and

    b) reliability of supply issues.

2. The SRC is seeking to gain an understanding of the structure through which the electricity industry manages supply reliability risks. The SRC requires an initial information paper that provides:

    (a) a high level description of the components of the electricity industry's risk management structure for supply reliability; and

    (b) an initial indication of any areas or issues for further consideration.

Scope

3. This information paper:

    (a) provides a high level description of the supply reliability risk management[1] structure in the electricity supply chain, which in turn:

        (i) provides a brief description of the regulatory and commercial mechanisms that relate to risk management; and

        (ii) information on how reliability risks are defined and how responsibility for management of these risks is provided for in the overall risk management structure; and

    (b) identifies areas of the risk management structure that may be considered for more detailed assessment.

Context

Electricity consumers pay for and expect a reliable electricity supply. Consumers experience unreliability through the loss of supply (measured by duration and frequency of outages) and through momentary fluctuations in the quality of supply (e.g. voltage and frequency).

Reliability risks arise at certain points along the electricity supply chain and are mainly caused by the potential failure of assets and/or systems due to faults in components, or by external factors such as weather events, vegetation and third party damage (e.g. cars hitting power poles).

Good practice risk management places responsibility for the identification and mitigation of reliability risks on the parties that are best able to manage them. In New Zealand a combination of regulatory and commercial structures are used to place responsibility for

[1] In this paper 'risk management' means supply reliability risk management

reliability risk management on asset owners and service providers along the electricity supply chain.

For information a sample of some of the definitions used for ‘reliability’ is provided at Attachment 2.

Reliability forms one limb of the Authority’s statutory objective, that is to “promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers”. The Authority has interpreted its role with respect to reliability as being to promote or facilitate industry behaviour which minimises costs of services to consumers while being robust to adverse events.

The Authority is in the process of preparing its framework and plans for monitoring reliability and efficiency and expects to release this in the coming months. One of the Authority’s functions under the Act is to undertake industry and market monitoring, and the Authority’s framework for monitoring the ‘competition’ limb of its statutory objective has already been established. The Authority’s approach to monitoring reliability is expected to use data available through existing regulatory arrangements (including arrangements outside of the Code, such as the Commerce Commission’s regulation of lines companies) as much as possible, rather than attempting to duplicate those arrangements.

The Authority expects to be able to provide the SRC with a ‘dashboard’ of reliability statistics from across the electricity industry at its next meeting, following the initial development of this monitoring framework.

Risk management structure

Reliability performance is defined, measured and monitored through a combination of regulatory oversight by the Authority and the Commerce Commission, commercial contracts between industry participants, and the use of standards and guidelines.

Regulatory oversight

The primary means by which the Authority provides regulatory oversight of reliability is via the Electricity Industry Participation Code (Code). Key ways in which the Code manages electricity supply reliability include the grid reliability standards (GRS), common quality provisions (asset owner performance obligations), and benchmark agreements (currently only transmission). Schedule 12.5 of the Code sets out availability and reliability measures for the transmission for a range of transmission asset categories (see Attachment A).

The primary means by which the Commerce Commission provides regulatory oversight of supply reliability is through the price-quality regulation of Transpower and certain distributors (17 qualifying distributors). The Commerce Commission’s broader regulation (applying to Transpower and all distributors) includes information disclosure and the requirement for Transpower and all distributors to publish asset management plans.

Commercial contracting arrangements

The primary means by which commercial contracts and agreements formed in the electricity supply chain govern supply reliability is by defining (and limiting) the respective industry

participants' liabilities. Price risk management arrangements can also provide generators with financial incentives to manage the reliability of their plant.

Standards and guidelines

Asset owners and managers also use standards and technical guidelines to assist them with good practice risk management. Standards and guidelines commonly referred to by electricity network companies include:

- AS/NZ 31000:2009 Risk Management – Principles and Guidelines;
- PAS 55: 2008 Asset Management Standard; and
- New Zealand Asset Management Support Group (NAMS) International Infrastructure Management Manual.

Benchmarking is also used to identify the relative performance of network businesses across a range of measures. For example, Transpower contributes to, and gains reports from, the International Transmission Operations and Maintenance Study (ITOMS).

The extent to which the above standards, technical guidelines and benchmarking are applied in practice to the management of reliability risk appears to vary across network companies. This may be due to the relative sizes of the organisations and the costs of fully implementing the prescribed risk management practices.

Together the various arrangements and mechanisms described above at a high level amount to the risk management structure for the electricity industry.

The need for accountability

For reliability risks to be managed appropriately, the risk management structure should provide accountability for the management of reliability risks at the key points of the electricity supply chain. Under a successful structure responsibility and accountability for reliability risks would be defined and reported against. Reporting requirements are observed in the current risk management arrangements (see Table 1), however these are limited to regulated entities.

The need for meaningful information

Ultimately, electricity consumers manage the risks associated with unreliable electricity supply. To do this efficiently,[2] consumers require the provision of expected and actual supply reliability performance levels that are meaningful to them at the point of use.

Summary of supply reliability risk management structure

The diagram below summarises the various components of the structure that relate to and have a role in the management of reliability risks.

[2] For example, through insurance or back-up equipment.

Figure 1: High-level reliability risk management structure

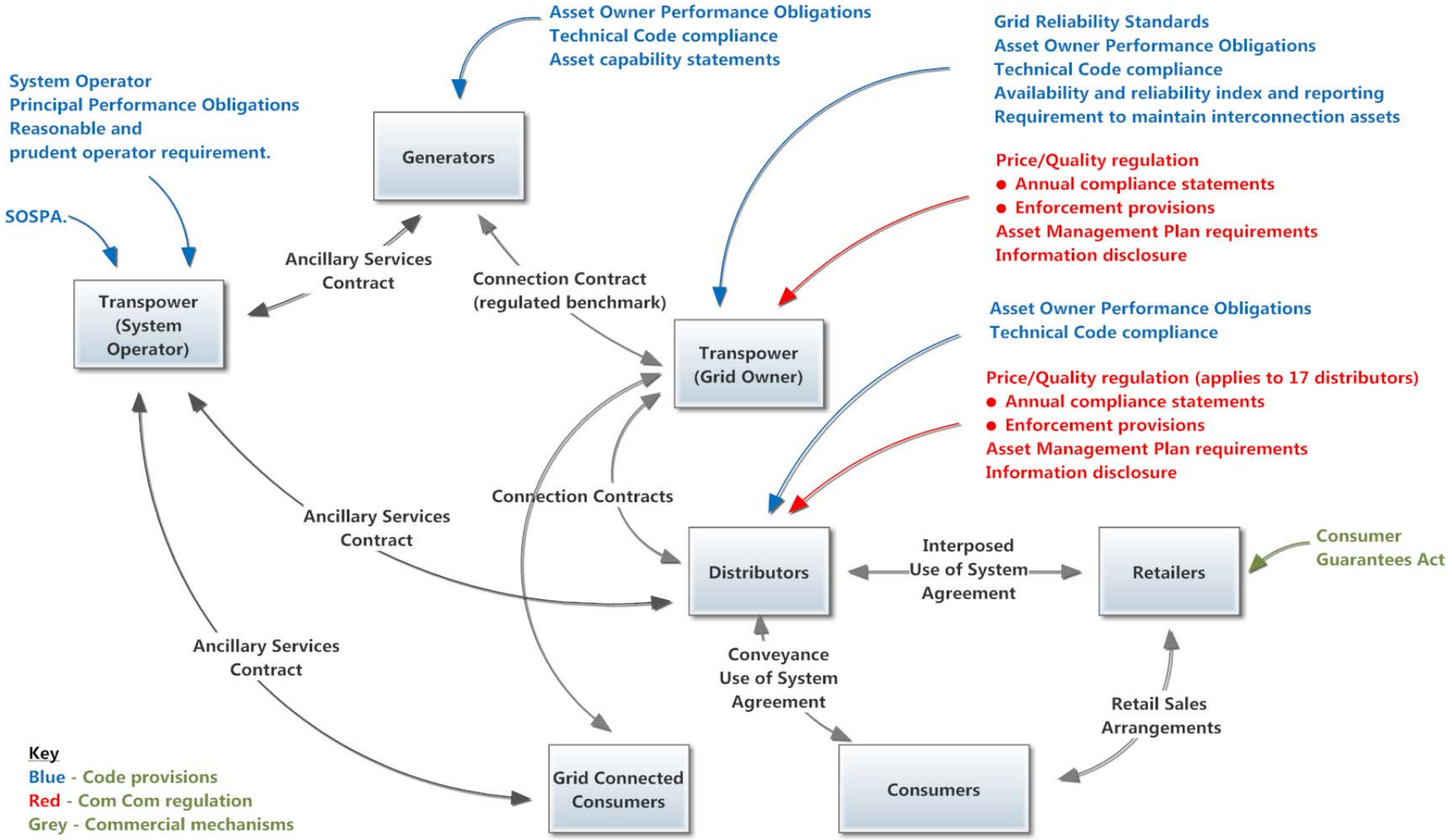

Table 1: Primary components of the risk management structure.

	Commerce Commission regulation	Authority regulation via the Code	Commercial contracts
Generation	None	Part 8 Asset Owner Performance Obligations and technical standards • Frequency • Voltage • Maintenance of synchronisation Technical Code compliance Submission of asset capability statement (a statement of capability and operational limitations of the assets) System operator monitors compliance	Connection agreements with Transpower for connection to the Grid (benchmark or alternative) and with distributors for embedded generators (current benchmark or model) Hedge contracts provide financial incentives on generators to manage generation plant availability and reliability
System Operator	None	Principle Performance Obligations Policy statement that sets out the policies and means that the System Operator will observe in complying with its principal performance obligations Reasonable and prudent operator requirement Requirement for an ancillary service procurement plan that identifies the need for	System Operator Service Provider Agreement Ancillary service provider contracts via the procurement plan

	Commerce Commission regulation	Authority regulation via the Code	Commercial contracts
		and quantity of ancillary services	
Transmission	Price-quality regulation • Number of total interruptions • unplanned interruptions Reliability measures for duration and frequency of outages (e.g. SAIDI, SAIFI, CAIDI[3]) Annual compliance statement report Quality Performance Report Asset Management Plan requirement Compliance process including provisions for Commerce Commission control	Part 12 Grid reliability standards Grid reliability reporting (Transpower required to publish grid reliability report) Availability and reliability index measures (see attachment 1) and reporting Technical Code compliance Requirement for Transpower to maintain interconnection assets Grid Owner Asset Owner Performance Obligations Each grid owner must ensure that the design and configuration of its assets (including its connections to other persons) and associated protection arrangements are consistent with the technical codes and, in the reasonable opinion of the system operator, with	Variations from benchmark agreement can increase or decrease reliability Increases – Transmission customer must certify consultation has taken place Decreases - Authority must approve If effect is uncertain Authority must approve

[3] These are all measures in common use as reliability indices within the electricity industry. SAIDI = System Average Interruption Duration Index, SAIFI = System Average Interruption Frequency Index, and CAIDI = Customer Average Interruption Duration Index.

	Commerce Commission regulation	Authority regulation via the Code	Commercial contracts
		maintaining the system operator's ability to comply with the principal performance obligations Benchmark agreement	
Distribution	Price-quality regulation • Number of total interruptions • unplanned interruptions SAIDI, SAIFI, CAIDI Annual compliance statement report Asset Management Plan (AMP) – evaluated against an AMP framework guideline The Commerce Commission's AMP guidelines include a requirement for distributors to undertake risk management when preparing AMPs Compliance process including provisions for Commerce Commission Control	Provision of asset owner capability statement Compliance with the Technical Code Compliance with Asset Owner Performance Obligations Provision of AUFLS blocks Part 12 A *Distributor use-of-system agreements and distributor tariffs - has* no references to reliability or risk Under section 16 of the Electricity Industry Act 2010 (the Act) the Authority can undertake market facilitation measures. Under this provision a model Use of System Agreement is under development	Transmission connection agreements Distributor Use of System Agreements – contain limitations of liability that effectively define risks the distributor will cover A Code amendment removing distribution companies' liability limitations arising from claims made against retailers under the provisions of the Consumer Guarantees Act comes into effect on 1 May 2012

	Commerce Commission regulation	Authority regulation via the Code	Commercial contracts
Retail	None	Under section 16 of the Act the Authority can undertake market facilitation measures. Under this provision Model domestic contracting principles and terms and conditions exist	Retail supply agreements – generally pass through limitations of liability from distributors

Initial findings and observations

An initial assessment of the framework is provided below. We have adopted the components of the AS/NZS 31000:2009 Risk Management Principles and Guidelines to record our initial findings.

Establish the context	A level of context is provided either through the Code, regulation or contract or in documentation such as Annual Planning Report (APR) and asset management plans (AMPs). This context generally relates to the specific component of supply (e.g. transmission, distribution). A whole-of-supply context for supply reliability risk management appears to be implicit rather than explicit in the electricity industry's supply reliability risk management structure. Evidence of this is in the absence of a single definition of supply reliability (see Attachment 2 for a sample of reliability definitions)
Risk analysis and evaluation	Where regulatory requirements call for them, examples of risk analysis are provided in disclosed information. These include risk assessments that are undertaken in AMPs, in Transpower's APR, and in the system operator's management of asset capability and ancillary service procurement. Most distributors' AMPs describe the use of AS/NZS 31000:2009 as the basis for their risk management practice. Transpower and some distributors refer to PAS 55:2008 asset management standard for guidance and this contains asset risk strategy development and implementation. Reviews undertaken by the Commerce Commission have revealed areas where analysis of risks could be improved (e.g. identification of the worst performing feeders, improved asset condition data) Where regulation does not require publication of risk management planning documents, none are seen. It is expected that normal commercial incentives are present to produce efficient supply reliability risk management.
Risk treatment	In the regulated components of the supply reliability risk management structure the treatment of, or solutions for, mitigating supply reliability risk are visible. Examples are AMPs, APRs and compliance statements to the Commerce Commission on reliability performance. When it is identified that performance is falling below requirements the Authority and the Commerce Commission have the power to impose compliance. In the unregulated areas of the supply reliability risk management structure, the treatment of risk is not explicitly visible and it is expected that commercial incentives motivate parties to treat the risks they have

	identified.
Communication and consultation	Evidence of communication and consultation for regulated entities include: • Information disclosure provisions on asset management require publication of AMPs and asset reliability performance; and • Consultation on reliability levels. Publicly available information from unregulated entities on the condition of assets and supply reliability risk management practices is generally limited. Some information is likely to be made available to investors particularly at times of major share offers. The Code requires asset capability statements to be maintained. However, the information is not used to obtain a view of asset supply reliability risk.
Monitoring and review	Observed monitoring and reporting includes: • Annual compliance statements on supply reliability performance (17 distributors and Transpower); and • Code compliance monitoring. Reviews include: • Commerce Commission reviews of Transpower and distributors; • External scrutiny of disclosed information; and • Post Code breach compliance reviews.

Possible areas for SRC consideration

The following are initial observations and thoughts on potential aspects of supply reliability risk management that could be considered for improvement.

(More specific discussion may be possible at the next SRC meeting, when the secretariat expects to be able to present some consolidated reliability data based on the performance statistics currently available within the industry).

It should be noted that the focus of the SRC should be on reliability issues across the electricity industry, rather than the performance of specific parties operating within it.

The current focus is on individual entity risks rather than whole-of-system risks

As noted above, supply reliability risk management is provided through a combination of regulatory provisions and commercial mechanisms placed on individual entities. Therefore, the current focus tends to be on the performance of individual entities rather than the overall electricity system. The implicit assumption is that this will deliver the required outcomes.

The role of the SRC is to provide advice to the Authority on reliability of supply issues. Based on their own knowledge, and the knowledge of their organisations, does the SRC consider that this individualistic approach to risk management is delivering the desired outcomes for overall system reliability, or are there material system-wide or “cross-boundary” risks that this approach is failing to capture?

The monitoring of supply reliability is based on retrospective performance rather than on the management of risk

The price/quality regulations and Code provisions relating to supply risk management are generally reactive to performance breaches. The nature of electricity systems is that the impact of sub-optimal asset management practices may not be seen through deteriorating supply reliability performance for several years.

Internationally regulators are working to develop improved benchmarking methodologies that are intended to provide indications of how regulated entities are managing assets. Given New Zealand's relatively large number of distribution entities, such benchmarks may provide useful information and insights on supply reliability.

Does the current approach of looking at retrospective performance, rather than risk management itself (that might tell us more about what performance we could expect in the future) give us sufficient confidence in the levels of reliability that can be expected in the future?

Attachment 1

Schedule 12.5 cls 12.119 and 120
Availability and reliability index measures

Asset type	Asset category		Planned unavailability	Unplanned unavailability	Number of planned interruptions	Planned unserved energy MWh	Number of unplanned interruptions	Unplanned unserved energy MWh
Interconnection transformer branches	220/110 kV interconnecting transformers and associated equipment		1.56%	0.06%	0.03	0.10	0.02	0.72
	220/066 kV interconnecting transformers and associated equipment		0.66%	0.02%	0	0.00	0	0
	110/066 kV interconnecting transformers and associated equipment		2.25%	0.02%	0	0.00	0	0
Interconnection circuit branches	220 kV interconnection circuit branches and associated line end equipment		0.88%	0.05%	0.00	0.00	0.13	9.87
	110 kV interconnection circuit branches and associated line end equipment		1.67%	0.07%	0.08	0.50	0.28	10.45
	66 kV interconnection circuit branches and associated line end equipment		1.25%	0.08%	0.14	0.46	1.31	1.88
Shunt assets	Capacitor banks and associated equipment	High (220 kV - 66 kV)	0.81%	1.33%	0.0	0.00	0.02	0.03
		Low (33 kV - 11 kV)	0.81%	1.33%	0.0	0.00	0.02	0.03
	Reactors and associated equipment		1.33%	0.31%	0.0	0.00	0.0	0.00
	Synchronous condensers and associated equipment		2.00%	1.00%	0.0	0.00	0.0	0.00
	Static var compensators and associated equipment		0.82%	0.04%	0.0	0.00	0.0	0.00
	Filter banks and associated equipment		1.03%	1.71%	0.0	0.00	0.0	0.00
HVDC Link Pole 2	One category including associated equipment		1.27%	0.51%	0.00	0.00	0.20	0.85

Compare: Electricity Governance Rules 2003 schedule F6A part F

Attachment 2

Definitions of reliability

Transpower's definitions

Reliability

The failure rate. For example, the number of failures per year based on experience over a long time period, say 10 years or more.[4]

Security

A term used to describe the ability or capacity of a network to provide service after one or more equipment failures. It can be defined by deterministic planning criteria such as (n), (n-1), (n-2) security contingency. A security contingency of (n-m) at a particular location in the network means that 'm' component failures can be tolerated without loss of service.[5]

Other definitions of reliability (engineering)

The ability of a system or component to perform its required functions under stated conditions for a specified period of time[6]

The probability of failure-free performance over an item's useful life, or a specified timeframe, under specified environmental and duty-cycle conditions. Often expressed as mean time between failures (MTBF) or reliability coefficient. Also called quality over time. See also availability[7]

The GRS are a set of standards against which the reliability performance of the existing grid (or future developments to it) can be assessed.

Code defines grid reliability through the GRS by specifying what it means if the GRS are being met the grid satisfies the grid reliability standards if—

(a) the power system is reasonably expected to achieve a level of reliability at or above the level that would be achieved if all economic reliability investments were to be implemented; and

(b) with all assets that are reasonably expected to be in service, the power system would remain in a satisfactory state during and following a single credible contingency event occurring on the core grid.

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[4] Transpower 2012 Annual Planning Report
[5] ibid
[6] http://en.wikipedia.org
[7] The business directory http://www.businessdictionary.com