Meeting Date: 27 May 2021

FIT-FOR-PURPOSE REVIEW: REGULATION AND MONITORING - DISTRIBUTION

SECURITY AND RELIABILITY COUNCIL

This paper is part of a series that investigates the extent to which current regulation is fit-for-purpose in terms of current and near-term circumstances. This paper addresses risks specific to electricity distribution.

Note: This paper has been prepared for the purpose of prompting SRC discussion about risk management within the industry. Content should not be interpreted as representing the views or policy of the Electricity Authority.

Contents

1 Fit-for-purpose review of distribution risks

1.1.1 The Security and Reliability Council's (SRC) functions under the Electricity Industry Act 2010 include providing advice to the Electricity Authority (Authority) on:

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

b) reliability of supply issues.

1.1.2 In pursuit of its purpose, the SRC developed a risk management framework to identify key arrangements for managing risks to reliability of supply. The framework identified the regulatory arrangements for assessing and managing distribution risks[1] as warranting periodic SRC attention.

1.1.3 The purpose of this paper is to enable the SRC to formulate advice to the Authority on whether regulatory arrangements relating to distribution are effective in managing the risk of widespread supply reliability events that result in an economic loss of more than $10 million. This includes whether regulation and compliance monitoring of distribution is adequate, is keeping up with technology changes and is fit-for-purpose.

1.1.4 To inform that advice, the paper:

a) describes the current regulatory arrangements relating to distribution;

b) assesses whether current regulatory arrangements are effective in managing potential supply reliability events that result in an economic loss of more than $10 million.

2 Regulatory arrangements for distribution

2.1.1 This section describes the current arrangements for distribution relevant to the reliable supply of electricity to consumers.

2.2 The Commerce Commission is the economic regulator

2.2.1 Under Part 4 of the Commerce Act the Commerce Commission (the Commission) has a role regulating markets where there is little or no competition – and little prospect of future competition. The Commission's aim is to mimic the effects seen in competitive markets so that consumers benefit in the long term.

2.2.2 Among other things, Part 4 is intended to ensure that regulated businesses have incentives to innovate, invest, and meet consumers' quality demands, but are also limited in their ability to earn excessive profits.

2.2.3 Part 4 provides for the following types of regulation:

a) information disclosure, which applies to all 29 EDBs; and

b) price-quality regulation, which applies to the 17 EDBs that do not meet the Commission's community owned criteria.

[1] 'Distribution' in this context refers to the assets owned and operated by the 29 Electricity Distribution Businesses (EDBs) that provide electricity lines services throughout New Zealand and that are regulated under Part 4 of the Commerce Act.

Information disclosure

2.2.4 The Commission sets requirements for all EDBs to publish information about their performance. The purpose of this form of regulation is to provide transparency about how the regulated businesses are performing and provide a check that regulation is working.

2.2.5 The businesses must publish information such as data on prices, measures of quality, financial information, and forecasts of future expenditure (including investment planned in the network). The Commission produces a summary and analysis of this information to help interested parties understand the performance of individual businesses, how they're performing compared to each other and any changes over time. Information disclosure requirements also include an EDB's asset management plan (AMP).

2.2.6 The Commission's information disclosure requirements have evolved over time, receiving two rounds of updates since they were first published in 2012.

2.2.7 With only relatively minor amendments, the current information disclosure requirements have been in place since the end of 2017, contained in decision [2017] NZCC 33.[2]

2.2.8 Information disclosure regulation provides for the following types of *historical information*:

a) financial information, which includes a range of prescribed and structured reports relating to, for example, return on investment, regulatory profit, related party transactions, and similar topics;

b) pricing and related information, which includes disclosure of pricing methodologies, capital contribution policies, prescribed terms and conditions of contracts, prices, information on quantities and revenues billed, and information on financial distributions arising from ownership interest (such as under community trusts, customer trusts and customer cooperatives); and

c) non-financial information relating to network assets.

2.2.9 The category of disclosed information in item c) above includes a wide range of templated historical information about network assets for the disclosure year, such as an asset register, asset age profiles, network demand and network reliability.

2.2.10 The network reliability schedule requires a summary of the key measures of network reliability (interruptions, SAIDI, SAIFI and fault rate) for the disclosure year.[3] It includes SAIDI and SAIFI data broken down by the cause (if known) and the main equipment category involved.

---

[2] In addition, around that time, the Commission published information about its priorities for the electricity distribution sector for 2017/18 and beyond. See the documents linked at this page: https://comcom.govt.nz/regulated-industries/electricity-lines/commissions-role-in-electricity-lines/our-priorities-in-electricity-distribution, particularly the open letter linked at the bottom of that page.

[3] See [2017] NZCC 33, schedule 10. SAIDI and SAIFI are standardised indices relating to the duration and frequency of planned and unplanned interruptions.

2.2.11 Moving to *forecast information*, the information disclosure requirements include disclosures relating to asset management plans (AMPs) and related forecast information.

2.2.12 Relevant to supply reliability, the purposes of AMP disclosure are that the disclosures must provide sufficient information for interested persons to assess whether:

a) assets are being managed for the long term;

b) the required level of performance is being delivered; and

c) costs are efficient and performance efficiencies are being achieved.

2.2.13 The purposes of AMP disclosure also include that an AMP "… *(3) Should provide a sound basis for the ongoing assessment of asset-related risks, particularly high impact asset-related risks.*"[4] Updated AMPs must be disclosed for each disclosure year.

2.2.14 The core elements of AMPs are:[5]

a) a focus on measuring network performance, and managing the assets to achieve service targets;

b) monitoring and continuously improving asset management practices;

c) close alignment with corporate vision and strategy;

d) that asset management is driven by clearly defined strategies, business objectives and service level targets;

e) that responsibilities and accountabilities for asset management are clearly assigned;

f) an emphasis on knowledge of what assets are owned and why, the location of the assets and the condition of the assets;

g) an emphasis on optimising asset utilisation and performance;

h) that a total lifecycle approach should be taken to asset management; and

i) that the use of 'non-network' solutions and demand management techniques as alternatives to asset acquisition is considered.

2.2.15 Relevant to supply reliability, the disclosure requirements are designed to produce AMPs that, amongst other things:[6]

a) specifically support the achievement of disclosed service level targets;

b) emphasise knowledge of the performance and risks of assets and identify opportunities to improve performance and provide a sound basis for ongoing risk assessment; and

c) promote continual improvements to asset management practices.

---

4 [2017] NZCC 33, clause 2.6.2.

5 [2017] NZCC 33 Attachment A: AMP design

6 Ibid.

2.2.16 AMPs must include a section about risk management that provides details of risk policies, assessment, and mitigation, including:

a) methods, details and conclusions of risk analysis;

b) strategies used to identify areas of the network that are vulnerable to high impact low probability events and a description of the resilience of the network and asset management systems to such events;

c) a description of the policies to mitigate or manage the risks of events identified in b); and

d) details of emergency response and contingency plans.[7]

Recognising that continual improvement to asset management practices for a complex infrastructure business represents a journey over time, information disclosure includes a requirement that each EDB provides a self-assessment of its *asset management maturity*.

2.2.17 Asset management maturity disclosure requires that EDBs complete templated schedules, intended to be used by providing a reference to supporting evidence or an explanation of the self-assessment. Asset management maturity disclosure is more in the nature of a gap analysis as opposed to a formal audit process. Successive asset management maturity disclosures are expected to track an EDB's progress towards enhanced asset management practices and capabilities over time.

2.2.18 Of note for the SRC is that the details included in this section on information disclosure are a small subset of the detailed requirements set out in [2017] NZCC 33, that codify and relate more specifically to consideration of an EDB's risk management practices.

2.2.19 Appendix A provides more detail about the Commission's acknowledgement (since the release of [2017] NZCC 33) that sound asset management practices are of fundamental importance achieving good outcomes for consumers.

Price-quality path regulation

2.2.20 Price-quality regulation involves setting price and quality controls for EDBs that are not owned by their consumers, i.e. EDBs that do not meet the Commission's 'community owned' criteria.[8] At a high level, these controls involve capping the total revenue the companies can earn from their consumers and requiring them to maintain their average quality to certain levels.

2.2.21 Price-quality regulation is intended to ensure that businesses do not have incentives to reduce quality to maximise profits under their price-quality path.

2.2.22 Quality standards are focused on the reliability of the electricity network. For each of the 17 EDBs subject to price-quality regulation, the Commission sets annual

---

7 Ibid. clause 14

8 The rationale for the law that exempts consumer-owned EBDs from price-quality regulation is that the exempt EDB's consumers have enough input into how the business is run. More information about the EDBs that are exempt from price-quality regulation is available here: https://comcom.govt.nz/regulated-industries/electricity-lines/commissions-role-in-electricity-lines/consumer-owned-electricity-distribution-businesses

limits for the average number and duration of power outages across the region. EDBs breach their quality standards if the number or duration of power outages exceeds their annual limit in 2 out of 3 years.

2.2.23 The current limits are based on each EDB's historic performance. In calculating and assessing their compliance with the standards, the Commission's rules limit the impact of one-off events like significant storms, in order to consider the performance of the network as a whole over the year. This helps focus the quality standards on the EDB's performance in ensuring reliability does not reduce over time.

2.2.24 Each year EDBs must report to the Commission on whether they have complied with the rules. If not, the Commission may take a range of enforcement steps including a formal warning, or court action seeking penalties.

2.2.25 There are 2 types of price-quality paths relevant to EDBs. All non-exempt EDBs start on a 'default' path. The Commission uses relatively low cost approaches to set these paths for the 17 businesses that are price-quality regulated.

Customised price-quality paths

2.2.26 If a default path does not suit the particular circumstances of an EDB, the EDB can apply for and propose its own 'customised' price-quality path. Customised paths are informed by significantly more business-specific information, and rely on more in-depth audit, verification, and evaluation processes.

2.2.27 To date, 4 EDBs have elected to apply for customised price-quality paths:

a) Orion (2014-2019) – to address the impact of the Canterbury earthquakes on its costs and revenues and to fund future network investment;[9]

b) Powerco (2018-2023) – to replace significant parts of its network built in the 1950s and 60s and nearing the end of its life and to provide for regions experiencing strong growth, so as to maintain a safe, secure and reliable network for its customers;[10]

c) Wellington Electricity (2018-2021) – following a Government Policy Statement issued in light of the 2016 Kaikoura earthquakes, to ensure its network is better prepared to withstand and respond to a major earthquake by bringing emergency hardware, mobile substations, switchboards, critical emergency spares, and enhanced communication systems into the region, as well as strengthening substations;[11] and

d) Aurora (2020-2025) – to address historic under-investment in its network, which has resulted in a gradual deterioration of its equipment, including lines, poles and transformers. In recent years this has resulted in a higher number of safety incidents and an increasing number of unplanned service interruptions.[12]

---

9 https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-lines-price-quality-paths/electricity-lines-customised-price-quality-path/orions-20142019-cpp

10 https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-lines-price-quality-paths/electricity-lines-customised-price-quality-path/powercos-20182023-cpp

11 https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-lines-price-quality-paths/electricity-lines-customised-price-quality-path/wellington-electricitys-20182021-cpp

12 https://comcom.govt.nz/regulated-industries/electricity-lines/projects/our-assessment-of-aurora-energys-investment-plan

Price-quality path non-compliance investigations

2.2.28 If EDBs disclose non-compliances with their default or customised price-quality path *quality standards*,[13] the Commission investigates the causes by considering the EDB's asset management practices, including asset data management, replacement and renewal planning and investment, and the full lifecycle management of assets.

2.2.29 The enforcement responses available to the Commission include:

a) no-further-action letters;

b) compliance advice letters;

c) warning letters;

d) administrative settlements; and

e) Court proceedings.

2.2.30 The Commission has undertaken a number of quality non-compliance investigations in the past 7 years, with outcomes including warning letters in 8 cases, a compliance advice letter in 1 case, and High Court proceedings that imposed fines in 2 cases.

2.2.31 EDB quality standard non-compliances generally breached network quality standards through excessive levels and/or durations of power outages.

2.2.32 Currently, 2 EDB non-compliance investigations remain open.

2.3 The Act places reliability-related obligations on the Authority relevant to distribution

2.3.1 The Electricity Industry Act 2010 (Act) places obligations on the Authority in relation to supply reliability.[14]

2.3.2 The second limb of the Authority's statutory objective says the Authority is to promote reliable supply by the New Zealand electricity industry for the long-term benefit of consumers.

2.3.3 The Authority interprets reliable supply to mean reliability and security in relation to both continuity of supply[15] and quality of supply.[16] The Authority interprets reliable supply by the electricity industry to mean the security and reliability of supply arising from the actions of all parties in the electricity industry, including generators, transmission and *distribution networks*, retailers, and electricity consumers.[17]

---

13 While we focus on quality standards as being most related to reliability and risk management, the Commission also investigates non-compliances related to an EDB's price path.

14 The Act s.16(1) provides the Authority's functions, including: *(g) to undertake industry and market monitoring, and carry out and make publicly available reviews, studies, and inquiries into any matter relating to the electricity industry:*

15 In relation to the continuity of supply, reliability refers to the rate and duration of outages, and security refers to the resilience of the system to adverse events (i.e., where outages are avoided despite significant adverse events occurring).

16 In relation to the quality of supply, reliability refers to the extent to which the voltage and current waveforms are of a constant magnitude and frequency, and security refers again to the resilience of the system to material fluctuations in the magnitude and frequency of voltage and current.

17 Electricity Authority, 14 February 2011, Interpretation of the Authority's statutory objective, p. 16.

2.3.4 In accordance with its statutory objective, the Authority's role in relation to supply reliability is to put in place incentives and obligations on industry participants that result in efficient levels of reliable supply.

2.3.5 The primary way in which the Authority does this is through the development and enforcement of Electricity Industry Participation Code 2010 (Code) provisions. The Code contains a mixture of market-based and administrative mechanisms that contribute to the reliable supply of electricity.

2.3.6 The Code parts relevant to distribution are listed in Table 1.

Table 1: The Code parts relevant to distribution

Code Part	What it covers	Relevant to reliable supply?
Part 6	Sets out provisions relating to the connection of distributed generation to networks. It provides a framework to enable the connection of distributed generation and sets out the regulated terms that will apply unless parties have agreed otherwise.	Yes. Connection of active energy sources to local networks can impact reliable supply to both local network users and to users across the wider grid.
Part 8	Relates to common quality and sets out the performance obligations of the system operator and asset owners (including distributors), arrangements concerning ancillary services, extended reserve, and technical codes.	Yes. As 'connected asset owners', distributors have obligations in respect of grid connection requirements, grid emergencies and extended reserve (AUFLS)
Part 11	Sets out obligations in relation to: a) the management of information held by the registry b) a process for switching ICPs between retailers c) responsibility for metering installations switching between metering equipment providers d) provisions relating to the management of events of default by traders.	No.
Part 12A	Sets out provisions relating to distributor agreements and arrangements.	No. Aspects of distributor agreements related to reliable supply are regulated under the Commerce Act – see paragraph below.

2.3.7 However, section 32(2)(b) of the Act prohibits the Authority from doing or regulating anything that the Commission is empowered to do or regulate under Part 4 of the Commerce Act.[18]

2.3.8 As a consequence of the Court of Appeal's decision in the matter of Vector Limited v Electricity Authority (March 2019), the Authority is unable to regulate or mandate quality standards (as that term is used in Part 4 of the Commerce Act).[19] Accordingly, matters relating to EDB and distribution network quality, performance, including asset/risk management, are left to the Commission.

2.3.9 We know of one significant exception to this division of regulatory responsibilities, involving the Minister-directed inquiry into the October 2014 Penrose substation fire.

2.3.10 The next sub-section briefly summarises the matters arising from this major event relevant to distribution assets and risk management practices.

Case study: The October 2014 Penrose fire raised questions about the reliability of distribution assets located at a Transpower substation

2.3.11 Section 18 of the Act provides that the Minister may request the Authority to review and report on any matter relating to the electricity industry.

2.3.12 On 7 October 2014, the Minister wrote to the Authority Chair noting the significant power outage that affected around 85,000 households and businesses[20] in parts of Auckland for up to two days or more, the evident result of a fire at Penrose substation on 5 October. The Minister noted that this was a significant event as it caused significant disruption and cost, and raised questions about the reliability of power supply.[21]

2.3.13 Specifically, the Minister asked the Authority to investigate and address the following questions:

a) what caused the loss of supply or contributed to it, including potentially systemic factors such as risk management systems, asset health monitoring and maintenance practices, network design and regulatory incentives and controls?

b) what fire hazard mitigation systems were in place; and did they operate as intended?

c) what actions were taken during the course of the outage in respect of:

i. ensuring the safety of people and equipment?

---

18 This is a paraphrased summary of the provisions of the Act s.32(2)(b) relevant to the point being made – refer to the Act for the complete provisions.

19 The Court recognised there was some uncertainty in the functions of the two regulators and stated the Authority can regulate quality issues that fall outside the purposes of the Commerce Act 1986 but may not regulate or mandate quality standards as that term is used in Part 4 of the Commerce Act. The judgement is available at https://www.ea.govt.nz/development/work-programme/consumer-choice-competition/default-distribution-agreement/development/final-court-of-appeal-decision-on-the-default-distributor-agreement/

20 Subsequently determined to be 75,339 households and businesses following more detailed analysis.

21 See https://www.ea.govt.nz/monitoring/enquiries-reviews-and-investigations/2014/section-18-review-of-auckland-power-outage-5-october-2014/

ii. communicating with affected and interested parties (including emergency services) about the impact of the event and timeframes for restoration of supply?

iii. mitigating the loss of supply and expediting restoration?

d) what the estimated economic impact of the outage was on customers?

e) what actions will be taken or are recommended, as a result of the outage and subsequent investigations, to improve the resilience of power supplies and management of outages?

2.3.14 The event involved a large number of distribution cables belonging to Vector Limited (Vector) installed in a covered, open-air cable trench at Transpower's Penrose substation.

2.3.15 The Authority's inquiry:

a) identified lapses in risk management by both Vector and Transpower; and

b) estimated the economic cost to customers due to the loss of supply was between $47 million and $72 million in 2015 dollars.

2.3.16 The inquiry report concluded that the risk of a cable trench fire at Penrose had not been identified. Before the fire, neither Vector nor Transpower had identified:

a) the risk of fire ignition from failure of a power cable in the Penrose cable trench (the ignition risk) or

b) the risk posed by multiple power cables co-located in the Penrose cable trench (the co-location risk).

2.3.17 Consequently, neither Vector nor Transpower took steps to prevent a fire in the cable trench at Penrose or lessen the supply interruption impact of such a fire on customers.

2.3.18 The reports generated by the inquiry provided rich documentation of available lessons covering many areas of network planning, operation and risk management. The lessons were widely disseminated throughout the industry.

2.3.19 This brief case study is an example of major event reporting that is given a particular focus and urgency through the exercise of Ministerial power. Left to their own devices, the involved businesses would probably have taken much longer to get to the same point and disclosed significantly less in terms of available lessons.

2.3.20 See also risk area 12 in Table 2.

2.4 The tree regulations are administered by the Ministry of Business, Innovation, and Employment

2.4.1 The Electricity (Hazards from Trees) Regulations 2003 (the "Tree Regulations") protect the security of the supply of electricity, and the safety of the public, by:

a) prescribing distances from electrical conductors within which trees must not encroach;

b) setting rules about who has responsibility for cutting or trimming trees that encroach on electrical conductors;

c) assigning liability if those rules are breached; and

d) providing an arbitration system to resolve disputes between works owners and tree owners about the operation of these regulations.[22]

2.4.2 Trees and other vegetation growing into or otherwise coming into contact with power lines (exacerbated during storms) are a significant cause of power line faults.

2.4.3 In general, trees and power lines do not enjoy a comfortable co-existence. The workability and cost-effectiveness of the Tree Regulations have been questioned by EDBs for a number of years, with frequent calls for their reform.

2.4.4 The SRC invited MBIE to present on progress of the review of Tree Regs and has provided advice on the slow speed this work is progressing at. The SRC has provided advice to the Authority several times, most recently in March 2021 where it said:

"Authority staff provided an update on the progress of the review of the Electricity (Hazards from Trees) Regulations 2003 (Tree Regulations). The Tree Regulations review started in 2018 with consultation set for later this year. The SRC note the Tree Regulations are a key enabler for distributors to better manage the potential reliability issues caused by trees, and have been up for discussion for the last 20 years with little observed progress on the issues to date."

2.4.5 The SRC considers it is important the Tree Regulations review is completed, and consultation is followed through as scheduled in late 2021.

2.5 The Health and Safety at Work Act 2015 and live line work practices

2.5.1 At its meeting of 28 July 2017, the SRC considered a paper titled *Reliability implications of reduced use of high voltage live line work techniques: Why health and safety decisions may reduce use of HV live line work and what this means for reliability of electricity supply.*

2.5.2 The paper focused on the responses of some industry participants in the time since the Health and Safety at Work Act 2015 (HSWA) came into effect in April 2016. With the passing of the HSWA and in light of informal guidance from WorkSafe New Zealand (WorkSafe), many network businesses initially changed their practices to do more of their high-voltage (HV) line work de-energised. Some stopped live line work altogether.

2.5.3 Less live line work results in increased planned SAIDI and SAIFI for distributors, which in some cases requires outages at grid connection points. Supply security decreases with increased planned outages in parts of networks that have redundant circuits and substation equipment. Supply reliability decreases in parts of networks that do not have redundant circuits.

2.5.4 At the 28 March 2018 SRC meeting the secretariat advised that the ENA had completed a survey of its members on this topic in late 2017. However, the survey was too early for distributors to have detected any reliability impacts, though it

[22] Tree Regulations, section 3

confirmed that most distributors had (or were) changing their related policies. The ENA was at that time planning another survey on this topic.

2.5.5 Since then, an absence of concerns being raised by distributors provides some assurance that the reliability impact, if any, is not significant. In 2017 the prevailing view amongst distributors was that live line work was effectively prohibited. This has not been the case and live line work is still used.

3 Are regulatory arrangements for distribution effective in managing the risk of major supply reliability events?

3.1 Overview

3.1.1 This section:

a) identifies risks that could result in supply reliability events that cause an economic loss of more than $10 million; and

b) assesses whether current regulatory arrangements for distribution are effective in managing these risks.

3.1.2 With some exceptions, the current regulatory arrangements for distribution for the most part appear to be fit-for-purpose.

3.1.3 However, given the expected changes to the New Zealand electricity industry over the coming decade and more, it would appear prudent to reassess these arrangements in 3–5 years' time.

Table 1: The Authority's initial evaluation of whether regulatory arrangements for distribution are effective in managing the risk of widespread supply reliability events

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
1	New technology	Distribution congestion – consumer demand from the network exceeds distribution capacity (local over-current, under-voltage) Rapidly increasing penetration of in-home EV chargers adds significantly to ICP-level peak demand, especially if a peak is coincident with traditional winter evening peak demand periods. Similarly, electrification of process heat could result in the same risk. Issues may emerge at sub-transmission, distribution and/or LV network levels but possibly more acute at LV as LV networks are expected to experience materially different demand profiles from consumer EVs.	**Unlikely** Supply reliability issues, if any, will be very localised, meaning coincident widespread issues across a whole network will be most unlikely and any impacts commensurately at very low levels.	**Unlikely** EDBs have tools to address network congestion from coincident EV charging demand, including through EV-specific time-of-use price signals and additional LV/distribution network investment (in both monitoring equipment and additional capacity). Opportunities exist when assessed in combination with risk area #2, which is the opposite problem.	**Regulatory arrangements appear effective; at least for now** EDBs and regulators have a relatively long run-up to material levels of suburban EV charging. Time-of-use price signalling is already signalled as being acceptable by the Authority, which can regulate distribution pricing. The Commission periodically polls regulated businesses for emerging issues. If investments in network monitoring and/or capacity become an issue, the Commission has the regulatory tools to assess and adjust asset management plan expectations and price-quality path regulation.
2	New technology	Distribution congestion – export from consumer premises exceeds	**Unlikely** EDBs have a range of tools to address network congestion,	**Unlikely** EDBs have tools to address network congestion from	**Regulatory arrangements appear effective; at least for now**

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
		distribution capacity (local over-current, over-voltage) Rapidly increasing consumer investments in distributed energy resources (DER) at consumer premises overwhelms existing levels of distribution network (11 kV) and low voltage network (LV, i.e. 400/230 V) hosting capacity. Consumer solar and battery installations inject excess energy into premises (decreasing net import from the network at irregular times of the day) or inject excess net energy into the network at irregular times of the day.	including the ability to define connection and operation standards under Part 6 of the Code (which regulates connection of distributed generation to local networks). Supply reliability issues, if any, will be very localised, meaning coincident widespread issues across a network will be most unlikely and any impacts commensurately at very low levels.	coincident injection of excess in-premise energy into local networks, including through time-of-use price signals and additional LV/distribution network investment (in both monitoring equipment and additional capacity). Opportunities exist when assessed in combination with risk area #1, which is the opposite problem. Longer term, coordinated distribution system operation (a possible new function) may facilitate market-based solutions to localised supply reliability problems, including by incentivising DER with smart control systems to provide local ancillary services such as voltage regulation and demand-side management.	EDBs and regulators have a relatively long run-up to material levels of changes to DER. Time-of-use price signalling is already signalled as being acceptable by the Authority, which can regulate distribution pricing. The Authority can also amend Part 6, which deals with connection of distributed generation to address a problem. The Commission periodically polls regulated businesses for emerging issues. If investments in network monitoring and/or capacity become an issue, the Commission has the regulatory tools to assess and adjust asset management plan expectations and price-quality path regulation. The Authority regulates connection of distributed generation under Part 6 of the Code. Part 6 requires that distributors publish connection and operation standards that can impose relevant

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
					standards for connection equipment. If there is an issue, it is to do with the lack nationally consistent approaches by the 29 distributors.
3	New technology	(L4) Reduced resilience through greater dependence on automation/AI. EDBs' reliance on IT systems for monitoring and diagnosis leads to more frequent supply interruptions, impacting supply reliability.	**Unlikely** Possibly, if viewed in the context of multiple events where the risk is a primary factor but unlikely for any single event.	**Unlikely** This is a risk that would develop over many years with opportunities to diagnose and deploy mitigations.	**Regulatory arrangements appear effective; at least for now** EDBs and regulators have a relatively long run-up to any material issues in this area. Properly deployed, increased reliance on automation and AI may in fact improve resilience especially in rarely encountered operational circumstances. As with most longer term risks, regulatory reviews need to maintain a watchful stance and act if/when the risk becomes a shorter term or pervasive risk.
4	New technology	LV networks are not closely monitored by EDBs. Lack of monitoring of LV network status (energisation,	**Unlikely** If rapid adoption of consumer DER occurs, the role of LV networks will transition from	**Likely** As is evident from current EDB actions, some EDBs anticipate this risk and are	**Regulatory arrangements appear effective; at least for now**

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
		voltage, power flow, consumer net demand/injection), outage information and lack of access to information available from advanced meters leads to increasing reliability and power quality issues.	providing passive (one-way power flow and no active energy sources) 'last kilometre' consumer connections to more dynamic (two-way power flow with active energy sources) operation. International experience (e.g. some Australian states) suggests that this risk is particularly acute where Government policy incentivises (e.g. via capital contributions and feed-in-tariffs) widespread investments in consumer-level solar PV. There is currently no indication that this will be a risk in New Zealand. That being said, rapidly declining solar/battery system prices and equipment rental business models that enable DER aggregation at scale may lead to the same problem, perhaps at a slower rate. In any case, the likelihood of this risk exceeding the impact	already undertaking pilot trials of suitable monitoring and control equipment (sometimes called LV SCADA). Others EDBs don't have a good handle on it yet, but it isn't a problem yet. It becomes a question of whether EDBs can get on top of the issue in time (and preferably not too early either because that would represent unnecessary expenditure). Some innovative approaches are evident, e.g. Westpower's LoRaWAN networked power monitor trial, deploying potentially cost-effective home-grown technology. Commercial LV network monitoring systems are available from international power network equipment providers. Other approaches involve leveraging the functionality built into existing Advanced Metering Infrastructure (AMI) to exercise some level of control and obtain operational data suitable for network	EDBs and regulators have a relatively long run-up to monitor and investigate this risk. The price-quality regulated EDBs together can charge consumers around $1b per year, which can be used for innovative approaches or new technology. The 0.1% refers to an additional incentive mechanism that is in addition to the other incentives to innovate, with funding already available. The Commission's price-quality path regulation provides an additional incentive mechanism that is in addition to the other incentives to innovate, with funding already available., If investments in network monitoring become an issue, the Commission has the regulatory tools to assess and adjust asset management plan expectations and price-quality path regulation. This will require close and enduring engagement by the

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
			threshold looks to be unlikely at the LV network level.	monitoring and planning. Inverter standards are also an important factor in this – there's a need to ensure consistent reference to the latest relevant standard.	Commission and the regulated EDBs. A possible issue is that not all EDBs are subject to price-quality path regulation. This may have delivered good outcomes for affected consumers under relatively steady-state circumstances but may not be fit-for-purpose in the future if/when consumers adopt new DER and EV technologies at scale.
5	Cyber risk	Inadequate cyber security of critical network and non-network systems leads to material harm to those systems. Impacting supply reliability. A bad actor gains access to and control of critical IP network-connected operational equipment, such as Supervisory Control and Data Acquisition (SCADA) and network protection systems and uses this	**Likely** Relevant to distribution, SCADA systems require network connectivity between remote terminal units at monitored and controlled points on the network (e.g. circuit breakers at substations). In making this initial assessment, we have not investigated the actual deployment of SCADA and remote-controllable protection	**Likely** For example, a 2018 Deloitte report[23] stated: *"The threat is now becoming even more insidious, with reports of hackers tied to nation-states and organized crime trying to burrow their way into utility ICS [Industrial Control Systems], seeking to learn how systems operate, and positioning themselves to control critical system assets, such as power plants,*	**Regulatory arrangements may not be effective** Information disclosure requires publication of asset management plans. However, making mitigation strategies and defensive measures public could be counter-productive if it provides information that bad actors may use against the EDB. *We understand that reports related to this risk have been commissioned in some cases*

[23] https://www2.deloitte.com/content/dam/insights/us/articles/4921_Managing-cyber-risk-Electric-energy/DI_Managing-cyber-risk.pdf Page 4

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
		access to disrupt or destroy network equipment. Successful attacks on non-network IT systems may afford access to critical business systems.	systems (which would require a significant effort), we simply note that the technologies exist and broadly understand that they have been deployed by some EDBs. A full-scale cyber attack on inadequately protected SCADA/protection systems could give rise to network-wide disruption. Risks include multiple exploit purposes, such as financial theft/fraud, theft of customer data, business disruption, destruction of critical infrastructure, reputation damage, threats to life/safety and regulatory. The bad actors include organised criminals, nation-states, insiders/partners, hacktivists, and skilled individual hackers. The potential impact is likely growing as reliance on communications and 'internet of things' is growing.	*substations, transmission, and distribution networks, and to potentially disrupt or destroy them."*	*but, for obvious reasons, these are kept confidential.* *Needs further assessment by specialists.*
6	Regulatory arrangements	Reliance on historical levels of SAIDI/SAIFI for	**Likely**	**Likely**	**Regulatory arrangements may not be effective**

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
		information disclosure and setting price-quality paths: • may not be an effective indicator of long run reliability • may not be sufficient to bring underlying reliability issues to the surface. Consequently, there is a risk that EDBs may not invest to achieve efficient reliability levels, leading to diminished supply reliability.	Given the magnitude of expenditure levels, it seems intuitively likely that a $10 million threshold would be met In the aggregate. *Would need to be subject to focused analysis*	This risk is arguably likely in the aggregate. This topic is further complicated by the level of reliability being largely caused by factors outside the EDBs' immediate control: network density, topography, underground vs overhead, radial versus ring network design, etc.	SAIDI/SAIFI metrics are not perfect, but appear to be a practical measure that EDBs and the Commission have good data for. The compliance and enforcement effects are quite strong, with recent court imposed penalties in the millions. Key issues: - There's a time lag between poor asset management (e.g. under-investment and high SAIDI). Recognising this, the Commission looks at other measures like asset age and condition as well. - It's difficult to assess what consumers think of the price-quality trade-off. When engaged, consumers typically don't want to pay extra for better quality, which is why the Commission uses historical data as a baseline. The Commission is encouraging EDBs to improve their consumer engagement to better understand this. It's also made more difficult by different consumers having

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
					different preferences – that are supplied from the same network. - SAIDI and SAIFI data excludes the low voltage part of the network, which might be an increasingly large source of problems with high EV penetration. Further, the price-quality path aspect applies only to EDBs subject to price-quality path regulation. Default price-quality paths represent a simplified, low burden regulatory approach to regulating monopoly infrastructure businesses. Customised price-quality paths are provided as the mechanism for addressing situations where a EDB considers the default path does not meet its specific needs. However, EDBs have argued that CPP applications have a high barrier as they are costly to prepare and give rise to a significant burden of business disruption. EDBs

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
					can also apply for a quality standard variation.
7	Regulatory arrangements	Regulatory arrangements are not sufficient to incentivise innovation. For example EDBs have an incentive on them to grow their RAB. Technology may be exacerbating how these arrangements are being perceived	**Likely** In aggregate over the whole sector.	**Uncertain**	**Current regulatory arrangements may require review as new technology impacts on EDBs become more certain** This is a difficult risk to assess. The risk is not that there's a chance that innovation is not incentivised at all, rather the risk is that insufficient innovation occurs (although 'insufficient' is at best a qualitative assessment). Even then, innovation needs to be linked to reliability. The Commission discussed this in their reasons paper on the 2020 price-quality path reset for EDBs. The section is worth reading in whole at this link, page 80, paragraphs 4.52 – 4.55.
8	Regulatory arrangements	The review of the 'Tree Regs', announced in 2015 but only started in 2019 due to competing priorities, fails	**Likely** Trees and other vegetation coming into contact with live power line conductors give	**Likely** MBIE has commenced a scoping review in late 2018 and recommended to the	**Current regulatory arrangements are ineffective**

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
		to capture the potential to improve supply reliability. The specific risk is that the review will not provide the workable process and risk based approach that EDBs seek.	rise to faults, particularly acute during storms. EDB rights to control vegetation close to power lines are provided in regulations introduced in 2003 and a review has been pending for some years. Given the magnitude of vegetation management expenditure levels (as an indicator of the length of overhead network at risk of vegetation damage, particularly in severe weather events), it seems intuitively likely that a $10 million threshold would be met if the review of the current regulations fails to deliver material improvements.	Minister that a full review be carried out. The full review commenced with a stakeholder workshop in December 2019 but progress is evidently slow, given the last update on MBIE's website occurred in June 2020. It is likely that Covid-19 issues have bumped the review to a lower priority.	As concluded in MBIE's scoping review, the current arrangements are inadequate. The full review, while started, appears to operate at a low priority and, at this stage of the process, there is a significant likelihood that EDBs may not get the improvements they seek.
9	Asset management related	Consumers connected downstream of N security networks (at distribution, sub-transmission and/or transmission levels) receive lower reliability network service that may not meet their expectations. Both planned and unplanned	**Unlikely** A non-duplicated network configuration provides only N-level security, resulting in more frequent outages but for a relatively small number of consumers as compared with consumers supplied through N-1 or better configurations.	**Likely** By definition, without local backup, planned and unplanned outages of non-duplicated network assets will trigger supply losses for downstream consumers. Typically causes infrequent local consumer concern but is	**Current regulatory arrangements are likely effective** Disclosure of asset management plans provides a major focus on each EDB's approach to setting security levels in different supply situations. Forecast

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
		outages trigger loss of supply unless local backup solutions are provided (by the consumer or that network asset owner).	In particular, this applies to remote rural communities that express relatively high expectations of service reliability (e.g. beach-side holiday homes). The costs of providing a more secure supply can be high. Unless and until local network demands grow to a level that can be shown to provide net benefits, N security configurations will endure. Note that there will be some common risks across N-1 networks (i.e. risks like the Penrose fire where multiple circuits in the same open-air trench were subject to fire risk.	below the $10 million threshold.	expenditures to maintain and improve supply security are also provided. EDBs are required to seek consumer feedback on their approaches to asset management. The Commission's asset management focus may highlight opportunities to improve the cost-effectiveness of supply alternatives, particularly given the capabilities of new technologies and rapidly decreasing costs. For example, consumer solar PV, batteries and so-called 'smart network' technologies may provide cost-effective solutions that can be tailored to meet individual consumer preferences and reliability values. The Commission's resilience and risk preparedness paper linked here has some relevant discussion.

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
10	Asset management related	Asset failure – societal cost of the failure is not reflected. Inappropriate assessment and/or application of Value of Lost Load (VoLL) parameters and local load duration profiles in network development planning.	**Likely** Industry practice associated with assessing and applying VoLL in asset management planning is long established, including in regulatory arrangements associated with asset planning. However, the values that individual consumers place on supply reliability can and do vary widely both across and within regions (e.g. urban/rural, industrial, agricultural, commercial, residential consumers)	**High** Most EDBs adopt deterministic network planning standards, at least for the purpose of undertaking and initial scan of area supply situations that may need review.	**Current regulatory arrangements are likely ineffective** Related to risk 9. Over time, VoLL assessments and their application within regulated asset management planning have become more granular in terms of their ability to take account of local circumstances. For example, transmission planning historically used a VoLL of $20,000/MWh for all grid exit points, regardless of the consumers within and circumstances of the supplied region. However, probabilistic network planning approaches are well established and used in other jurisdictions related to distribution. For example, the Australian Energy Regulator (AER) requires that regulated EDBs use probabilistic planning techniques in their expenditure planning. Similar to the recent focus on asset criticality, probabilistic expenditure planning could be

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
					considered for application in New Zealand. Probabilistic planning approaches take local load duration (i.e. 'peakiness') and a more disaggregated consumer VoLL profile into account in expenditure decision making.
11	Asset management related	(part L3) Ageing and/or under-invested distribution assets lead to deteriorating supply reliability and a bow wave of expenditure to recover the situation.	**Likely** Reliability issues can develop over long time periods, associated with the performance profiles of long-life assets. This is sometimes referred to as a 'bathtub curve', where asset failures occur either very early in the lifecycle (exposing manufacturing defects) or late, revealing end-of-life . Towards the end of asset lifecycles, assets can be 'sweated' with minimal levels of routine and preventative maintenance and deferred replacement decision making. Reliability performance alone	**Possible** While serious issues can take many years to become revealed, eventual reliability impacts are inevitable. The Aurora experience is an example of this.	**Current regulatory arrangements are likely effective for non-exempt EDBs** The Commission has both the regulatory tools (information disclosure and price-quality path regulation) and the strategic focus on asset management to bring issues to light (information disclosure) and track the businesses' own monitoring and decision making (disclosure of asset management plans). However, the regulated businesses themselves have a major role in outcomes for their consumers, making decisions that balance

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
			is not necessarily a good early warning indicator. Eventually, increased failure rates will likely emanate relatively quickly and, due to the nature of distribution networks, are frequently related to safety concerns from specific asset failure modes (e.g. broken poles, explosions, poor resilience in severe weather conditions).		performance with profitability. EDBs exempt from price-quality path regulation may have a greater ability to avoid early detection as compared with non-exempt EDBs. Lacking access to a CPP may also leave an exempt business 'on its own' facing up to its consumer owners and justifying accelerated price rises. The recent CPP decision for Aurora showed that regulation can deliver an outcome that should provide a recovery path. Time will tell whether the performance/profitability settings inherent in the Commission's decision are efficient.
12	Asset management related	(P5) Insufficient information sharing and planning amongst industry participants in relation to reliability of supply risks.	**Possible** Lack of information and planning sharing could lead to issues exceeding $10 million	**Unlikely** EDBs invariably rely on in-house, contracted and industry body expertise (e.g. EEA, ENA). Industry bodies enjoy comprehensive membership across EDBs and are active in coordinating and documenting the science	**Current regulatory arrangements are likely effective** The Commission's information disclosure toolset provides a wide range of regularly updated performance metrics enabling analysis and benchmarking across EDBs.

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
				of existing and emerging good industry practice. EEA's technical topic-specific guidelines and ENA's distribution technology roadmap are examples.	While it may impose a burden on the resources of some EDBs, the highly structured data gathering approach itself conveys notions of good industry practices, i.e. the performance metrics a EDB should be tracking itself. An example of this effect is the degree of sophistication of the current structured, documented AMPs as compared with where EDB practices were at under less regulated arrangements, say 20 years ago. A possible area for improvement could be sharing the lessons from major supply failure events. The natural initial stance of a EDB (or transmission owner) in a major event is to protect its reputation by controlling the process and information released, at least until the causes and effects are well understood by it, and likely forgotten by affected consumers. The 2014 Penrose fire is a memorable

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
					major event that brought to light the failure to recognise the fundamental risk of co-locating numerous cable circuits, including numerous cable joints, in a single open-air trench. The Minister's rapid initiation of an inquiry under section 18 of the Act ensured this did not happen and that lessons learned, disseminated across industry, were a primary objective of the inquiry. Not all major events might invoke a similar level of Ministerial interest and we consider more transparent and certain process would assist in disseminating lessons learned from lower impact but interesting and informative events.
13	Asset management related	(P6) Changes in industry live line and supply restoration operating guidelines lead to reduced supply reliability performance.	**Likely** Requires further analysis to unearth relevant data about the impact of live line maintenance restrictions in planned outage situations and supply restoration restrictions following.	**Likely** Driven by WorkSafe's stance, some EDBs have invoked restrictions, understood to include outright bans on live line work and restrictions the process of trial reclosing circuits following a circuit fault	**Regulatory arrangements are unlikely to have a material bearing on this risk** … at least as they relate to supply reliability. The change in some EDB (and Transpower) policy in recent

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
			Counterbalancing this, when well signalled to affected consumers in advance, planned outages are usually associated with low levels (but non-zero) of VoLL.	before carrying out a physical inspection.	years has been driven by safety risk concerns. In the current environment, it is up to Board's and management of individual EDBs to set policy relevant to live line work and supply restoration practices. *Requires further assessment.*
14	Asset management related	(L6) Loss of industry knowledge and capability through an aging workforce affecting supply reliability.	**Unlikely** This is a widely expressed concern, repeated over many years for a variety of reasons, prevalent during periods of significant change, e.g. around the time of the major industry restructuring resulting from the industry reforms of the late 1990s. Nevertheless, times inevitably change, life goes on and needs find a way. Some aspects of knowledge and capability deserve a happy retirement.	**Unlikely** Unlikely in the aggregate. Smart businesses develop the ways and means to retain individuals' knowledge and capability, including through apprenticeships, effective record keeping and archiving. Local and international industry bodies (EEA, ENA, IEA, CIGRE, etc) are repositories of collectively acquired knowledge and information.	**Regulatory arrangements are unlikely to have a material bearing** Subject matter experts and highly experienced individuals eventually slow down and/or retire, move industries, move within in the industry, and suffer illnesses that affect careers. The risk expressed here may simply reflect current trends in population demographics.
15	External events with widespread or global impact	(P4) COVID-19 (or any future) pandemic harms supply reliability and leads to	**Unlikely** A supply reliability event at distribution level would need to be something akin to the	**Unlikely** Industry-specific risks are strongly correlated with New Zealand's overall pandemic	**Regulatory arrangements appear effective for the most part**

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
		extended supply interruptions. The coronavirus impacts are associated with: a) personnel capability and travel, particularly in relation to mobile field service personnel moving and working between local locations and possibly multiple regions b) the lack of availability of imported goods/services, particularly network spares, replacement and development equipment. EDBs relied on current stocks of spares during the 3 lockdowns and may have depleted stocks and take time to recover, especially for overseas manufactured items. If there is another Level 3 or 4 lockdown before stocks are recovered there may be issues restoring electricity supply after faults. c) general level of preparedness and responsiveness for managing incidents	2014 Penrose fire (involving distribution cables in a single shared concrete duct). There is no evidence that the presence of a pandemic would make such an event any more or less impactful than in more normal times. The initial response might be delayed, although frontline responders (including distribution and emergency services personnel) are essential workers and a lack of transport congestion would only help response speed. The scenario would need to expand to something like a simultaneous lockdown and (say) a severe earthquake before COVID-specific risks. An extended period of lockdown would bring new risks into play, e.g. risks associated with the availability of essential spares due to impacts on international supply lines.	management via a containment and elimination strategy. The first 2020 lockdown period resulted in significant reductions of peak demand across the board. This kept traditional winter capacity pressure off distribution networks. While longer term replacement and development capex work was put on hold, operations and first responders in the field workforce were designated essential service providers. Workforce mobility to network trouble spots actually improved in many cases, particularly in densely populated urban/CBD areas. EDBs responded quickly, identifying and developing mitigations for new risks. With the benefit of this experience, medium-term expectations are that pandemic-related mitigations and controls are in place and new capabilities have been developed that enable a more	EDBs largely took their own initiatives within nationally set movement restrictions, thereby treating the event more like a business-as-usual situation (as opposed to something that required an immediate engagement with industry regulators). For future lockdowns, there may need to be more formalised essential services status provided by the Ministry of Health and/or the Police, so that frontline line staff can traverse regions and get to trouble spots. The Authority's market monitoring function reached out to a sample of EDBs and field service providers to gain an understanding of responses taken across the distribution sector.

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
				flexible workforce (e.g. working from home is now routine).	
16	External events with widespread or global impact	(P2) Physical attack (war, terrorism, sabotage) damages power system assets and/or cuts supply.	**Likely** A focused or collateral attack on distribution system assets and systems could conceivably vastly exceed the $10 million threshold. In a major war, distribution system integrity would be amongst the least of an affected country's concerns.	**Unlikely but finite** While these risks are typically considered to be of low likelihood in countries like New Zealand, they can and do happen.	**Regulatory arrangements are likely to be effective** … at least as far as they go in emphasising the criticality of developing service resilience through asset management planning.
17	External events with widespread or global impact	(P3) Natural disaster damages power system assets and/or cuts supply.	**Likely** The nature of a natural disaster in New Zealand conditions is that such disasters involve severe earthquakes, volcanic activity, and weather events (severe winds, snowstorms, floods). In circumstances where the relevant forces of nature are felt in well-populated areas, damage to network assets can develop very quickly to extreme and widespread levels.	**Moderately likely** Distribution networks are generally well-distributed by their nature but can achieve significant levels of power delivery density in major urban/CBD areas and region-wide disruption in severe weather events.	**Current regulatory arrangements are likely effective** For example, the risk of an earthquake causing major disruption to electricity supplies in the capital city of Wellington gave rise to a CPP by local EDB Wellington Electricity that specifically focused on this risk. The CPP process appears to have focused on delivering a specific set of outcomes (e.g. improving the number and

#	Risk area	Risk to supply reliability	Initial evaluation: Impact threshold met?	Initial evaluation: Likelihood	Initial evaluation: Effectiveness of current arrangements
					location of strategic spares and undertaking targeted resilience investments). It is questionable whether exempt EDBs would have appropriate incentives to invest in significant resilience investments in the absence of the regulatory certainty that price-quality path regulation provides to non-exempt EDBs.

4 Conclusions for supply reliability risks related to electricity distribution

4.1 Recapping what we have done

4.1.1 For each identified risk area in Table 2 above we stepped through:

a) a description of the risk as relevant to supply reliability;

b) an initial assessment of the identified risk in terms of:

i. an event reaching the impact threshold; and

ii. the likelihood of the risk occurring; and

c) an initial assessment of whether current regulatory arrangements appear to be adequate.

4.1.2 Of note is that the purpose of the risk identification and assessments presented in this paper is to prompt and assist informed discussion by the SRC of the risk areas that might fall within the SRC's attention criteria.

4.1.3 In several areas, the level of research and analysis required to provide more definitive advice is beyond the scope of the paper. In these cases, further development of the fit-for-purpose assessments will significantly benefit from input and feedback from the relevant regulators, in particular the Commission in respect of its role as the economic regulator of distribution businesses.

4.2 New consumer technology is driving multi-year generational change

4.2.1 It is well established that we live in times of very rapid change in many sectors of the economy. In electricity distribution in particular, long established assumptions about the network's roles are in the process of being completely turned around, albeit we are at an early stage. The direction of power flow on radial LV and distribution level circuits was not designed in when these networks were engineered. Without mitigations, power quality issues will rapidly become newsworthy events.

4.2.2 While we are fortunate in having access to lessons learned by our near neighbours, it is critical to regularly review the fitness for purpose of industry regulation that was largely developed under longstanding assumptions.

Appendix A The Commission's focus on asset management practices and regulatory risk

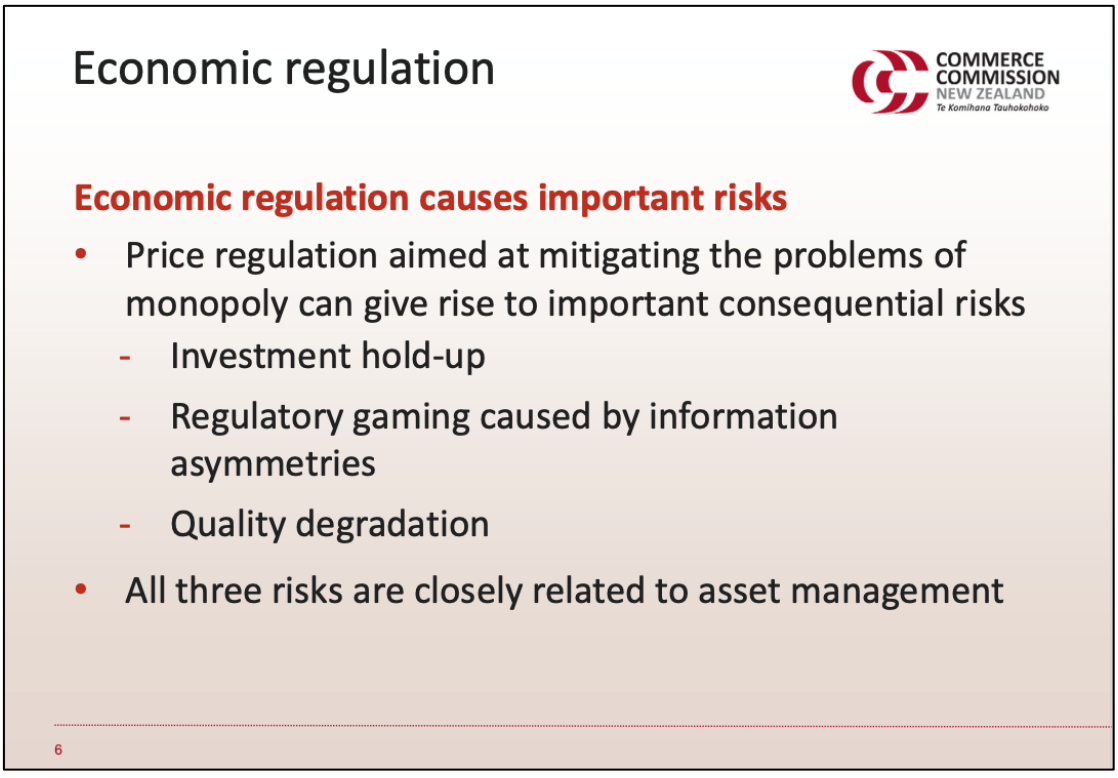
A.1 In June 2019, the Commission released an open letter to inform stakeholders of its proposed programme of work in reviewing EDB asset management practices. The letter outlined what the Commission is trying to achieve by reviewing the asset management practices of EDBs and informed stakeholders of the Commission's current work programme in this area.

A.2 The Commission also engaged Partna Consulting Group (Partna) to report on the risk management practices, contingency and major events planning and network resilience investments included within EDB's 2018 and 2019 AMPs.[24]

A.3 With only relatively minor amendments, the current information disclosure requirements have been in place since 2010, with minor changes in 2013 and 2017 (decision 2017 NZCC 33). Around that time, the Commission published information about its priorities for the electricity distribution sector for 2017/18 and beyond.[25]

A.4 The Commission recognises that economic regulation of natural monopolies comes with risks, in turn driving the Commission's focus on asset management as a key mitigation of this risk.

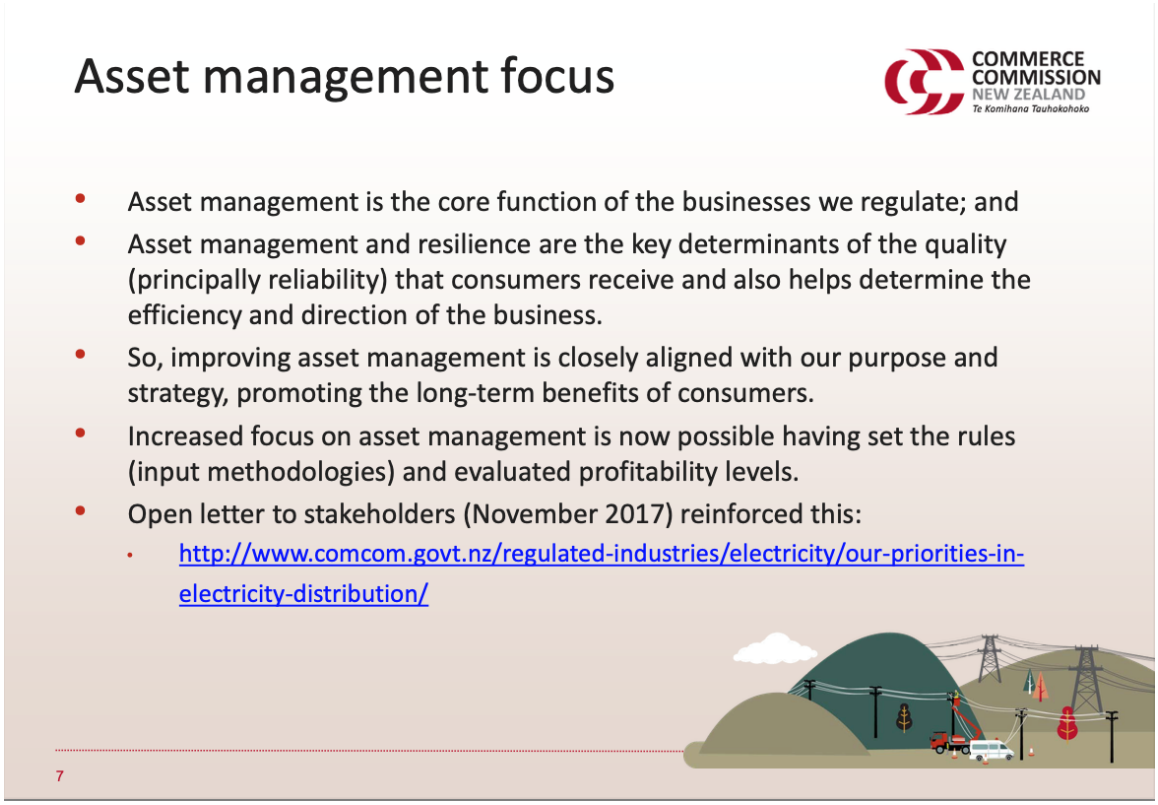
Figure 1 - risks of regulation[26]



24 The open letter and Partna report are linked on this page: https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-distributor-performance-and-data/review-of-asset-management-practices/review-of-electricity-distribution-businesses-asset-management-practices?target=documents&root=153861

25 See the documents linked at this page: https://comcom.govt.nz/regulated-industries/electricity-lines/commissions-role-in-electricity-lines/our-priorities-in-electricity-distribution, particularly the open letter linked at the bottom of that page.

26 Slides from a presentation by the Commission to the SRC, agenda item 23703SRC-11 dated 22 June 2018, titled *The Commerce Commission's focus on asset management*



A.5 Relevant to the reliability of supply to consumers:

(a) investment holdup gives rise to the risk that the right investments may be made too late, too early, or not at all

(b) accumulated over time, quality degradation may cause serious risks to supply.

A.6 For example, if an EDB considered the Commission's customised price-quality path process was too onerous in terms of the resources required or the costs involved, critical investment omissions may arise.

A.7 While larger EDBs may have better access to the resources required to diagnose serious underlying issues, smaller EDB's may lack these, leading to unmitigated reliability risks.

A.8 Relevant to the reliability of electricity supply to consumers, the Commission considers that:

(a) asset management is the core function of the businesses it regulates; and

(b) asset management and resilience are the key determinants of the quality (principally reliability) that consumers receive and also helps determine the efficiency and direction of the business.

A.9 The Commission has adopted an increasing focus on improving asset management practices, in accordance with its purpose.

A.10 Related to the focus on asset management in changing times, the Commission published an open letter on 29 April 2021 *Open letter—ensuring our energy and airports regulation is fit-for-purpose.*[27]

A.11 While not strictly asset management, the open letter discusses EV uptake, monitoring of low voltage networks, and information disclosure requirements.

27 https://comcom.govt.nz/__data/assets/pdf_file/0022/253561/Open-letter-Ensuring-our-energy-and-airports-regulation-is-fit-for-purpose-29-April-2021.pdf