

Monitoring the reliability of distribution networks

3 October 2016

Note: This paper has been prepared for the purpose of the Security and Reliability Council (SRC). Content should not be interpreted as representing the views or policy of the Electricity Authority.

Executive Summary

The Security and Reliability Council (SRC) functions under the Electricity Industry Act 2010 (Act) include providing advice to the Electricity Authority (Authority) on reliability of supply matters.

The SRC created the following action for completion by 1 April 2017:

“Develop a plan for reporting on the performance of the supply chain (such as generation, transmission and distribution) in terms of reliability of supply. The plan should discuss the relevant regulatory roles involved.”

The original incarnation of that action arose in the context of several papers that were presented to the SRC during 2012–14. The SRC sought information that enables monitoring of reliability from the point of view of consumers.

This paper provides some background to a presentation to be given at the 19 October 2016 SRC meeting. That background provides context for how the SRC came to create the above action, including information previously presented to the SRC by the Quality of Supply Incentives Working Group.

The presentation will discuss the Authority’s formative plan for monitoring the reliability of distribution networks. This is the largest area of reliability monitoring that the SRC receives no information on, so is a priority for development of reliability monitoring. Establishing a set of metrics for the monitoring of distribution network reliability will provide a key component for any future framework that attempts to provide a whole-of-system view of reliability.

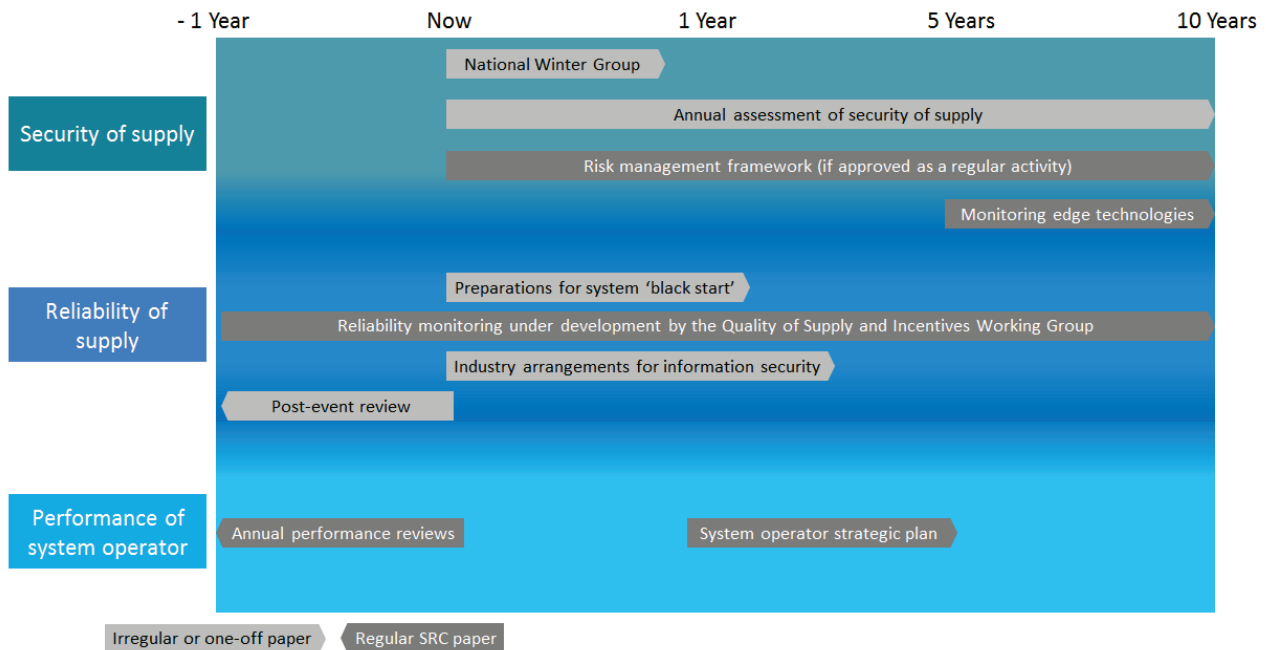
As distribution network monitoring would be a key input to an overall plan for monitoring of reliability, the Authority seeks the SRC’s:

- reactions to the proposed options for distribution network monitoring
- expectations for the overall plan referred to in the above action.

Background

The SRC received several papers during 2012–2014 on the topic of monitoring reliability. This reflects that it is an area where the SRC, to be able to fulfil its role, wants more information than is presently available. Illustrating this, an October 2015 analysis of the SRC's strategic alignment with its functions has revealed a reporting gap on reliability, especially relating to distribution networks.

Figure 1: October 2015 analysis of possible SRC activities compared with actual activities¹



Previous advice to the SRC on this topic has included:

- Supply reliability risk management (May 2012)²
- The Electricity Authority's role in reliability (August 2012)³
- Supply-side reliability – credible event data (August 2012)⁴
- Reliability dashboard and reliability-centred monitoring (May 2013)⁵
- Reliability-centred monitoring (February 2014)⁶
- Transpower event review (February 2014)⁷
- Reliability monitoring in the electricity sector (June 2014)⁸

¹ Available from <http://www.ea.govt.nz/dmsdocument/20048>

² <http://www.ea.govt.nz/dmsdocument/13011>

³ <http://www.ea.govt.nz/dmsdocument/13602>

⁴ <http://www.ea.govt.nz/dmsdocument/13594>

⁵ <http://www.ea.govt.nz/dmsdocument/14892>

⁶ <http://www.ea.govt.nz/dmsdocument/18106>

⁷ <http://www.ea.govt.nz/dmsdocument/18107>

⁸ <http://www.ea.govt.nz/dmsdocument/18545>

- Quality of Supply Incentives Working Group update (March 2015)⁹

Strata Energy Consulting (Strata) have provided their analysis of monitoring options to the Authority's Market Monitoring team

The Authority is organised into five functional groups, one of which is the Market Performance group. Within that group, the Market Monitoring team has responsibility for monitoring of electricity markets to enable the Authority to promote its statutory objective. This includes responsibility for producing the Authority's [Year In Review](#) and undertaking incident enquiries (such as the enquiry into the 2014 Penrose substation fire).

The Market Monitoring team commissioned Strata to research options for monitoring distributors' performance. To this end, Strata have identified and assessed the possible options and developed a demonstration model to initiate discussions about the value of the various monitoring options.

Whilst the Authority has asked Strata to identify and assess EDB performance monitoring measures that are broader than those relevant to the SRC, Strata has proposed the following three measures of performance for core reliability aspects of distribution services:

- Average service availability index (ASAI)
- Health of distribution networks
- Quality of supply.

Importantly for the SRC, the data, metrics and measures can be aggregated to form regional, island and/or national perspectives of the overall performance, cost and health of New Zealand's distribution networks. For example, the overall age and assessed condition of New Zealand's fleet of distribution transformers will be revealed. Using historical disclosure data, it will be possible to see changes over time in the state of the asset fleet against ASAI performance.

The March 2015 update on the work of the Quality of Supply Incentives Working Group included some useful tables of recommended and potential metrics for use by the Commerce Commission. For ease of reference, these are included in Appendix A of this paper.

Representatives from the Market Monitoring team and Strata will attend the SRC meeting and will provide more detail on the measures under development. They are keen to get the SRC's reaction on the measures under development and better understand the SRC's expectations for the two monitoring-related actions due to be provided to the first SRC meeting of 2017.

The SRC may wish to consider the following questions.

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|------------|---|
| Q1. | Does the SRC have any additional guidance for the Authority about the SRC's desired scope or composition of the monitoring of reliability of the entire supply chain? |
| Q2. | Does the SRC have any feedback on the options for monitoring of distribution network reliability? |
| Q3. | Does the SRC have any comment on the value of international benchmarking/comparisons in any reliability monitoring? |

⁹ <http://www.ea.govt.nz/dmsdocument/19276>

- Q4.** What further information, if any, does the SRC wish to have provided to it by the secretariat?
- Q5.** What additional advice, if any, does the SRC wish to provide to the Authority?

Appendix A Recommended and potential options for metrics of distribution quality of supply, prepared by Quality of Supply Incentives Working Group

The Quality of Supply Incentives Working Group March 2015 update to the SRC included two tables summarising the metrics it was recommending for reporting and those for potential future development. These are reproduced below in Figure 2 and Figure 3 for the SRC's ease of reference. Basic notes on measures/options that are not self-evident are included below each Figure, though the [full report](#) contains far more detail than can possibly be included here.¹⁰

Figure 2: Recommended metrics

Ref	Measure / Option	Value to customer (Current)	Data Availability	Incentive for timely investment	Ease of implementation	DPP Reset (RCP2)	RCP3	IDD
1.3	SAIDI	✓✓✓	✓✓✓	✓✓✓	✓✓✓	Yes	Yes	
1.4	SAIFI	✓✓✓	✓✓✓	✓✓✓	✓✓✓	Yes	Yes	
2.1	Unplanned outages	✓✓✓	✓✓✓	✓✓✓	✓✓✓	Yes	Yes	
2.2	Planned outages	✓✓✓	✓✓✓	✓✓✓	✓✓✓	Yes (Weighted)		
2.3	Based on company averages	✓✓	✓✓✓	✓✓	✓✓✓	Yes		
2.4	Identified by voltage level	✓	✓✓✓	✓	✓✓✓			Yes
4.1	Limits based on fixed historical data	✓✓	✓✓✓	✓✓✓	✓✓✓	Yes	Yes	
4.4	Allowance for natural variation	✓✓✓	✓✓✓	✓✓✓	✓✓✓	Yes	Yes	
6.1	Major event days	✓✓✓ (with proposed adjustments)	✓✓✓	✓✓✓ (with proposed adjustments)	✓✓✓	Yes (with proposed adjustments)	Yes (with proposed adjustments)	
7.2	Revenue linked incentives	✓✓✓	✓✓✓	✓✓✓	✓✓ Incentive rates to be developed	Yes	Yes	

Notes:

- 1) SAIDI stands for System Average Interruption Duration Index
- 2) SAIFI stands for System Average Interruption Frequency Index
- 3) 'Based on company averages' and 'Identified by voltage level' both refer to options to disaggregate interruption data
- 4) 'Limits based on fixed historical data' refers to an option for establishing performance targets
- 5) 'Allowance for natural variation' refers to refers to another consideration for the establishment of performance targets
- 6) 'Revenue linked incentives' refers to an option of establishing an incentive mechanism for meeting quality targets

¹⁰ The full report can be downloaded from <http://www.comcom.govt.nz/dmsdocument/11671>

Figure 3: Potential metrics

Ref	Measure / Option	Value to customer (Current)	Data Availability	Incentive for timely investment	Ease of implementation	DPP Reset (RCP2)	RCP3	IDD
1.8	CAIDI	✓✓✓	✓✓✓	✓	✓✓✓			Possible RCP2
1.9	Energy not supplied	✓✓✓	×	✓✓	×		Possible	Possible RCP3+
1.10	Capacity availability	✓	×	Unknown	×			Possible during RCP3+
1.11	Expected number and duration of outages	✓	×	Unknown	×			Possible during RCP3+
2.5	Identified by customer location	✓✓✓	✓	✓✓✓	✓		Possible	Possible (during RCP2)
2.7	Worst served customers	✓✓✓	✓	✓✓✓	✓			Possible (RCP3)
3.1	Customer satisfaction	✓✓✓	✓	✓✓✓	✓		Possible	
3.3	Quality of information provided during an outage	✓✓✓	×	✓✓✓	✓		Possible	
3.4	Processing of new connection applications	✓✓✓	✓	✓✓✓	✓		Possible	
3.5	Timely notification of planned outages	✓✓✓	✓✓✓	✓✓✓	✓✓		Possible	
4.3	Forward looking benchmarks	✓✓✓	✓	✓✓✓	✓			Possible at some point
5.1	Established by the EDB customer surveys	✓✓✓	×	TBD	TBD		Possible	Possible (during RCP2)

Notes:

- 1) CAIDI stands for Customer Average Interruption Duration Index (and is SAIDI/SAIFI)
- 2) 'Energy not supplied' refers to reporting the energy not supplied due to each interruption
- 3) 'Capacity availability' refers to reporting the percentage of capacity available and the duration of its availability
- 4) 'Identified by customer location' and 'Worst served customers' both refer to options to disaggregate interruption data
- 5) The four lines with a 3.X reference are all options for reporting of customer service measures
- 6) 'Forward looking benchmarks' refers to an option for establishing performance targets that can account for situations in which past performance is expected to be a poor indicator of expectations for future performance
- 7) 'Established by the EDB customer surveys' refers to distributors creating their own customer service performance limits