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**ASSET
MANAGEMENT**

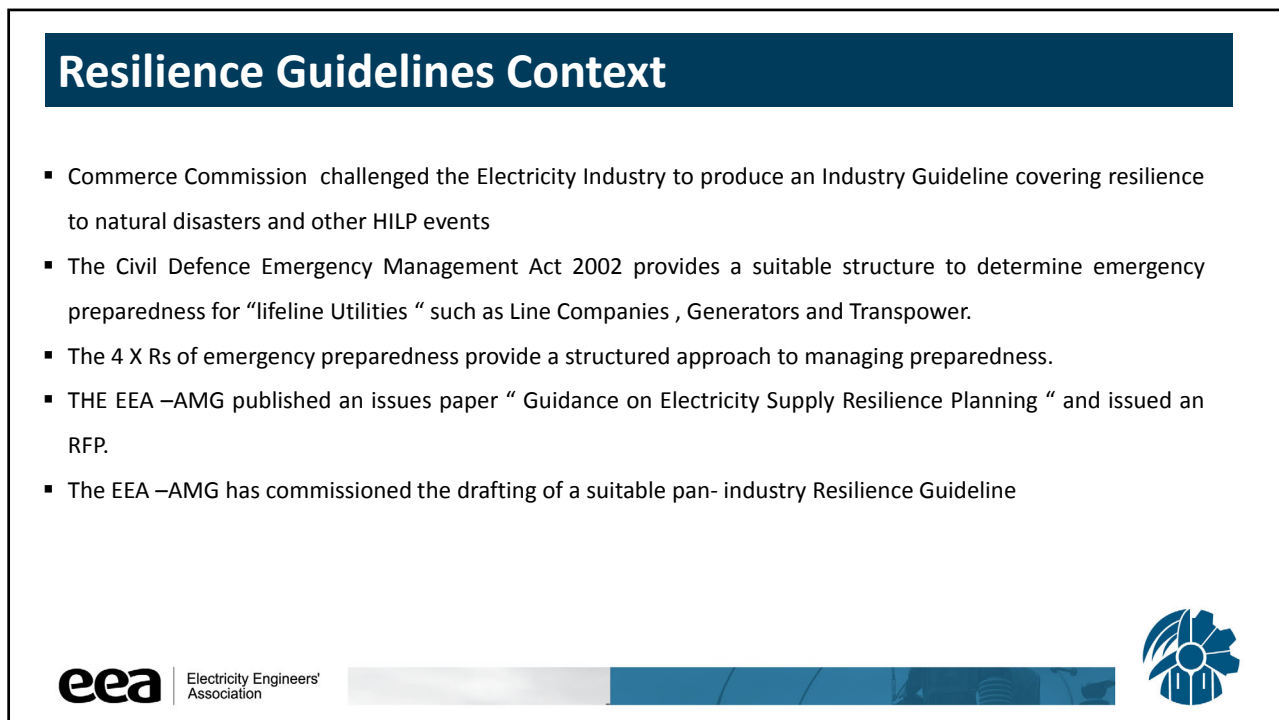
EEA –AMG Resilience Guidelines

EEA-AMG Forum
June 2019

EEA.CO.NZ




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Resilience Guidelines Context

- Commerce Commission challenged the Electricity Industry to produce an Industry Guideline covering resilience to natural disasters and other HILP events
- The Civil Defence Emergency Management Act 2002 provides a suitable structure to determine emergency preparedness for “lifeline Utilities “ such as Line Companies , Generators and Transpower.
- The 4 X Rs of emergency preparedness provide a structured approach to managing preparedness.
- THE EEA –AMG published an issues paper “ Guidance on Electricity Supply Resilience Planning “ and issued an RFP.
- The EEA –AMG has commissioned the drafting of a suitable pan- industry Resilience Guideline

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EEA Technical Working Group Resilience Guidelines

The Industry representatives appointed to the TWG are:

- Grant Hogan Unison(chair)
- Russell Watson Northpower
- Steve Peake Transpower
- Dave Evans Powerco
- Craig Wong Orion
- Michael Glass Wellington Electricity
- TBC Electrix
- Tas Scott Mitton Electronet (Consultant)
- Sean McCready EEA Project manager



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Resilience Definition for the guide

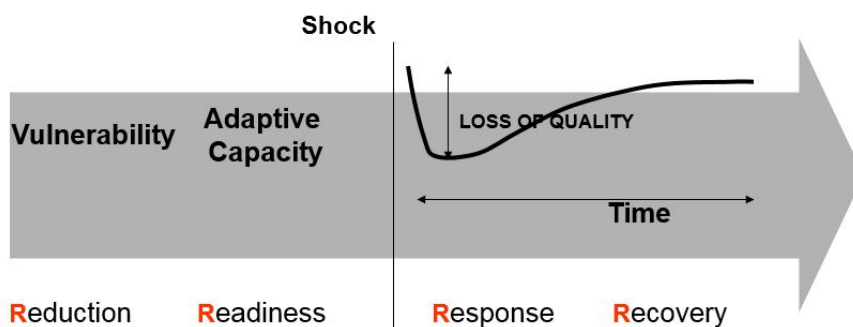
The electricity infrastructure is a critical lifeline system and of utmost importance to our daily lives.

Power system resilience characterizes the ability of assets, networks, systems and people to anticipate, absorb, adapt to and rapidly recover from a disruptive event.



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Quantifying resilience...



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Reduction, readiness, response and recovery

THE 4RS

The New Zealand integrated approach to hazard management:

- **Reduction:** Identifying and analysing long-term risks to human life and property from hazards; taking steps to eliminate these risks if practicable, and, if not, reducing the magnitude of their impact and the likelihood of their occurring.
- **Readiness:** Developing operational systems and capabilities before a major loss event or emergency happens; including self-help and response programmes for the general public, and specific programmes for emergency services, lifeline utilities and other agencies.
- **Response:** Actions taken immediately before, during or directly after a major loss event to save lives and protect property, and to help communities recover.
- **Recovery:** The coordinated efforts and processes to bring about the immediate, medium-term and long-term holistic regeneration of a community following a major loss event.



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Proposed Guide Structure

Note: The Guideline is to focussed on Line Company Emergency preparedness as Generation/ Transmission have already published “ Staylive “ Guidelines.

Contents Proposed:

- Background and introduction
- Scope and objectives
- Resilience defined
- Current industry activity
- The 4XR’s explained:
 - Resilience metrics-RMMAT
 - HILP analysis
 - Critical spares management
- Life Line Groups and function.
- Reference material
- Appendices:
 - (1) case studies
 - (2) RMMAT questions



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Economic assessment of HILP

VoLL is an important planning assumption when undertaking cost-benefit analysis to determine the benefit of investing in the grid to avoid interruptions. The reliability benefit of preventing (or mitigating) an event (via appropriate investment) is:

$$\text{Reliability Benefit} = \text{Probability of event} \times \text{Reduction in the amount of Unserved Energy} \times \text{VoLL}$$

where:

“**Probability of event**” represents the probability of an event such as an equipment outage due a major external event (eg earthquake, Storm, flood etc)

“**VoLL**” represents the economic value placed on avoiding an interruption in \$/MWh,

and

“**Reduction in the amount of Unserved Energy**” represents the reduction in the amount of electricity in MWh that will not be supplied because of the event, with the reduction coming from mitigation or investment.

The reliability benefit can then be compared to the cost of investment to determine if it is economic to invest (i.e. if the benefits exceed the costs). Multiple investment options for mitigating the event are usually considered. In this way, VoLL is an important planning assumption.



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Introducing- Resilience Management Maturity Assessment Tool – “RMMAT”

KEY FEATURES:

- Based on the AMMAT concept
- Key resilience assessment questions to be established based on 4XRs
- Line Companies can assess their degree of resilience maturity by self assessing and scoring each question
- Possibility that such a scheme may form part of Asset Management Plan information disclosure requirements



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Typical RMMAT topics

REDUCTION (OF RISK):

- Have risk assessments of network vulnerabilities to catastrophic natural HILP events e.g. earth quakes, major weather bombs, and major plant failure been carried out ?
- Has risk mitigation analysis to assess what risk reduction steps should be undertaken using Cost /Benefit studies to rank options been carried out ?
- Has a process of formulating and publishing specific resilience improvement plans been documented in the AMP to reduce risk where economic- giving costs and time frames ?



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Typical RMMAT questions contd.

READINESS

Plans formulated before a major event strikes which address matters such as:

- Has a company- wide emergency response plan (based on CIMS principles) been published establishing staff responsibilities and customer/ stakeholder communication processes?
- Are network operational switching contingency plans are drawn up for major plant outage scenarios?
- Is a comprehensive Critical Spares inventory established and spares storage , access and ongoing management processes in place?
- Are emergency response plans practised and tested on a regular basis?
- Are disaster recovery centres are identified where backup control room functionality can be implemented if necessary?



Typical RMMAT questions contd.

RESPONSE

Actions to be taken after the event occurs to safely restore power supply as soon as practicable and includes:

- Is there a considered process of safety and damage assessment in place to manage the restoration of power supply?
- Are critical customer connections identified and planned to be addressed?
- Are their specific communication protocols in place regarding communication to customers and other stakeholders regarding restoration progress?
- Can BAU outage management systems be scaled up in terms of capacity to handle say ten times normal no power calls from customers ?



Typical RMMAT questions contd.

RECOVERY

Restoring the network in the medium term to the level of service enjoyed by customers prior to the big event.

- What comprehensive insurance policies / cover in place and is the process of making claims understood ?
- Are any network architecture matters identified that would be relevant (eg increased network diversity) when planning for asset replacement due to damage from a big event ?
- Is there a customer/ stakeholder communication plan to advise on recovery plans and progress (the timeframe may be several years)?



RMMAT Scoring system

Proposed to be a 0- 4 point scoring of a checklist of relevant questions i.e. :

0. **Not Aware** - The organisation has not recognised the need for this requirement and/or there is no evidence of commitment to put it in place
1. **Aware** - The organisation has identified the need for this requirement, and there is evidence of intent to progress it.
2. **Developing** - The organisation has identified the means of systematically and onsistently achieving the requirements, and can demonstrate that these are being progressed with credible and resourced plans in place.
3. **Competent** - The organisation can demonstrate that it systematically and consistently achieves relevant requirements set out in the Resilience Guide.
4. **Excellent** - The organisation can demonstrate that it employs the leading practices, and achieves maximum value from the management of its emergency management Resilience context.



Exercise 1 - RMMAT

Given the proposed questions, discuss the RMMAT scoring system in groups

FEEDBACK

1. Are the questions relevant to your organisations?
2. Are the proposed scoring criteria definitions appropriate?



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Critical Spares definition

Critical Emergency spares are items of plant or components of plant that need to be readily available at short notice to enable network repairs to progress after a major event such as an earthquake, weather event or major plant failure.

The type and amount of spares holding is dependent on the likely damage scenario to be faced in any particular major event and the Company's performance objective in terms of target restoration time.

e.g. one week, one month or three months

Spares could be held by the Company or may, if suitable, be the subject of supply contracts in times of Emergency

e.g. cable repair joints

What other factors do you consider should be included in thinking about the subject of critical spares inventories



Exercise 2- Critical spares

Using the following scenarios

- A. Earthquake
- B. Extreme weather event
- Assess the approach to the critical spares framework. What other areas need to be addressed?



Group exercise - Consider the following Scenarios:

Scenario A

A major 6.5-7.5R earthquake close to a major urban settlement which has potential for liquefaction, tsunami inundation and landslide rock fall activity.

- The network contains extensive underground cables both sub-transmission and distribution of varying age and condition. Cables in service are oil filled, PILCA construction and also XLPE. About 3000km of cables are in service.
- The zone substations are also of varying age and design concepts from outdoor structures to completely all indoor examples.
- Distribution substations are ground mounted above 100 KVA size overhead pole mounted substations are fixed to relatively old poles.
The rest of the overhead line network has a range of older concrete and wooden poles with wooden cross arms and pin insulators or varying types and design
- A legacy fleet of older oil filled MV ground mounted RMUs and switch fuse units are in service and also considerable metal clad indoor OCBs remain in service at zone substations and network switching stations



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Group exercise

Scenario B

A major weather event strikes a network covering a large rural area, including exposed coast lines with possible wind speeds of 150 km/hr. The wind is accompanied by very intense rainfall eg 250 mm over an 8 hour period over most of the network service territory. A major river catchment system is also located in the network service territory. The overhead line lengths (11 kV) in service is approximately 2500 Km with 300 Km of 33 kV subtransmission. The cable portions of this network are limited to small urban settlements and amount to 300 Km total 11kV and 200km of LV

The storm event lasts about 48 hours



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In thinking about the impact of these two different events-consider what critical spares policy and equipment holdings would be sensible to adopt

In your consideration address the following:

- What type of plant is likely to be damaged
- How easy is it to obtain such replacement plant in a hurry
- What quantities of spares of various types should be held
- Are some spares likely to be specialised and rare to source
- What sort of spares are like BAU consumables
- Where should such spares be located
- What precautions should be taken in how such spares are stored and managed
- What other plant might be useful to get power restored before permanent repairs can be made
- What other matters should be considered in respect to critical spares policy in the guide



Guideline Development

Time frame

Key Milestone	Due
First draft	28 th July
Consultation period	August - September
Consultation workshops	October - November
Final Edits	December - January
Publication	February 2020

