

Measuring and reporting asset risks: providing transparency to Board and Executive stakeholders

background

Our client was an Australian electricity network business that had suffered successive serious failures of a key zone substation. The failures resulted in prolonged loss of supply for certain customers, and attracted a high level of public and political scrutiny.

As a result of the second failure, the State Government commissioned an independent investigation into the root causes. The investigation found serious issues on many levels, including fundamental problems in our client's Asset Management systems.

Our client's response was twofold. First, it initiated a remedial program to systematically assess and make good its most critical zone substations. Secondly, it undertook to provide total Board-level transparency of the condition of its assets, the risks the business faced as a result, and its progress in addressing those risks. Marchment Hill Consulting was engaged to develop that reporting framework.

what Marchment Hill did:

The Challenges

Marchment Hill's consultants recognised several areas of commonality between our client's situation and that faced by other utilities:

- First, there was the challenge of reconciling Asset Management and Corporate views of risk. In our experience, many utilities struggle to present a sufficiently nuanced view of operational risks at Corporate level, leaving the Board vulnerable to unpleasant surprises. Our client was no exception in this regard.
- Second, we recognised that since the Board consisted of a mix of technically and non-technically oriented members, the reporting would need to be intuitively easy to understand, conceptually robust and supportive of Board-level decision making.
- Third, our client had a developing Asset Management team, with little of the system and process infrastructure seen in advanced Asset Management businesses available to it. We were conscious therefore of the need to balance the opportunities to support the development of our client's team, with a speedy yet pragmatic response given the business's current state of maturity.

what Marchment Hill did: We initially worked with our client to develop an asset hierarchy that comprehensively described their transmission and distribution assets and supported reporting at various levels of detail. Our client selected five asset classes that prima facie were the most critical, to prove the reporting concept.

Our approach

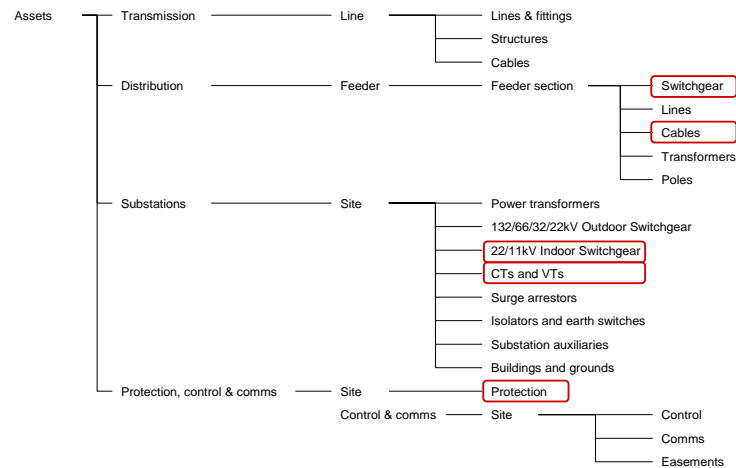


Figure 1: Agreeing an asset hierarchy was the first stage of building the reporting framework.

MHC developed an approach to presenting asset risk to allow our client to report on both the current state of its assets and the risks they presented, and the changes in those parameters over time as inspections and maintenance were completed. As well as traditional reports on maintenance expenditure, progress and reliability by asset class, we developed measures of asset condition, criticality and risk.

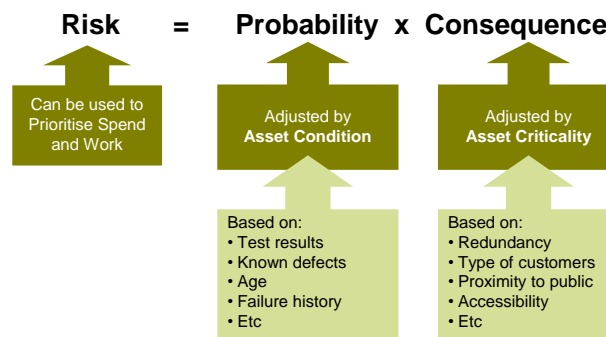


Figure 2: The framework built on widely-accepted risk relationships, but reflected the differences in risk level for individual assets within a class – a point that asset managers understand but that is sometimes lost in Board-level risk reporting.

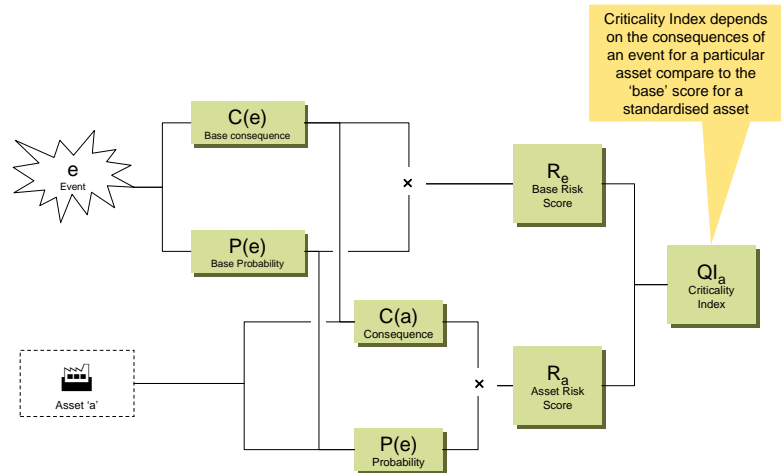


Figure 3: Illustration of the criticality concept developed for risk reporting. Criticality essentially measures the consequences of a risk event occurring on a particular asset, relative to other assets of the same type.

Working with subject-matter experts in the business, we then developed detailed condition and criticality evaluation frameworks for each asset class – and in some cases for particular sub-classes. This process provided the ideal platform for detailed and robust discussion on what asset data was truly relevant. MHC and our client invested considerable time in the process, and were rewarded with a thoroughly documented distillation of the business’s best knowledge on the assessment of its most critical assets.

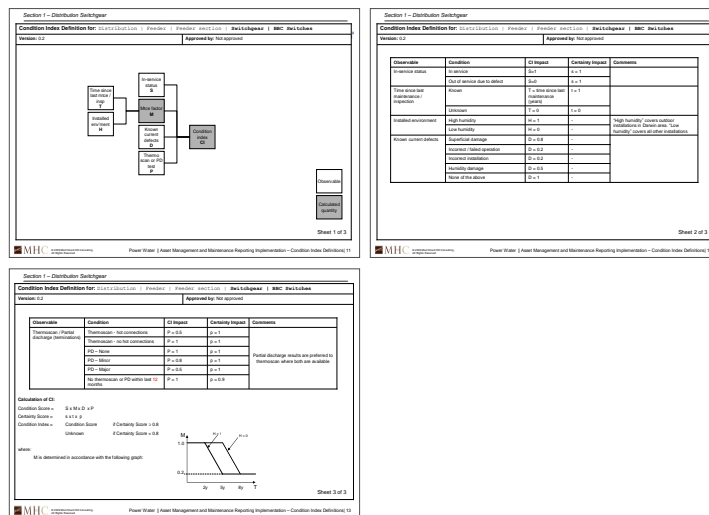


Figure 4: An example of the documentation for condition evaluation for a particular asset class. Actually documenting what is known about what factors drive loss of asset function is a valuable exercise in itself, and should inform inspection and maintenance strategies for each asset class.

In keeping with our approach of working with the client to support the development of the Asset Management team, Marchment Hill then built a series of spreadsheet-based 'test beds' to allow the evaluation frameworks to be thoroughly explored, tested, questioned and refined.

Observable	Condition	CI Value	Certainty Value	Comments
In-service status	In service	1	1	
In-service status	Out of service due to defect	0	1	
Known current defects - Superficial Damage	Yes	0.8	1	
Known current defects - Superficial Damage	No	1	1	
Known current defects - Incorrect / failed operation	Yes	0.2	1	
Known current defects - Incorrect / failed operation	No	1	1	
Known current defects - Low Gas	Yes	0.2	1	
Known current defects - Low Gas	No	1	1	
Partial discharge - inside tank	None	1	1	
Partial discharge - inside tank	Minor	0.8	1	
Partial discharge - inside tank	Major	0.2	1	
Partial discharge - inside tank	No PD test within last 12 months	0.8	0.9	
Partial discharge - terminations	None	1.00	1	
Partial discharge - terminations	Minor	0.80	1	
Partial discharge - terminations	Major	0.50	1	
Partial discharge - terminations	No PD test within last 12 months	0.80	0.9	

Figure 5: Screen shot from the Condition test-bed, showing the impact of a range of observables on assessed asset condition for a particular asset class (in this case, gas-insulated ring main units).

Consequence #	Domain	Consequence description	Base consequence score	Contingency or variable	State	Consequence level multiplier
CO5	OH&S	Harm to people from catastrophic failure of gas or vacuum insulated asset on switching	1	Remotely actuated?	Yes	1
CO5	OH&S	Harm to people from catastrophic failure of gas or vacuum insulated asset on switching	1	Remotely actuated?	No	5
CO6	OH&S	Harm to people from catastrophic failure of gas or vacuum insulated asset on fault	1	Presence of personnel	Absent	1
CO6	OH&S	Harm to people from catastrophic failure of gas or vacuum insulated asset on fault	1	Presence of personnel	Present	50
CR1	Reputation	Reputation damage from failure of zone substation assets / LOS	10	Location (ZS)	Rural	1
CR1	Reputation	Reputation damage from failure of zone substation assets / LOS	10	Location (ZS)	Urban	3
CR1	Reputation	Reputation damage from failure of zone substation assets / LOS	10	Location (ZS)	CBD	15
CR1	Reputation	Reputation damage from failure of zone substation assets / LOS	10	Redundancy (ZS)	n - 2 or greater	1
CR1	Reputation	Reputation damage from failure of zone substation assets / LOS	10	Redundancy (ZS)	n - 1	3
CR1	Reputation	Reputation damage from failure of zone substation assets / LOS	10	Redundancy (ZS)	No redundancy	15
CR2	Reputation	Reputation damage from shock to member of the public	50	Level of public traffic	None (asset in switchyard)	1
CR2	Reputation	Reputation damage from shock to member of the public	50	Level of public traffic	Low (rural areas)	1

Figure 6: Screen shot from the Criticality test bed, showing a selection of the factors that have an impact on asset criticality in relation to particular risk events.

Our client then collected real data for nearly 100 individual assets and applied the evaluation methodology to them. Marchment Hill worked with the business to simplify the evaluation framework to focus on the information most important in assessing asset condition and criticality.

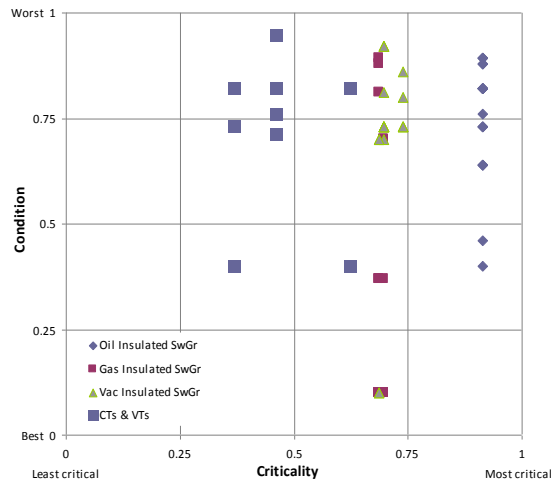


Figure 7: We trialled the asset evaluation methodology with a range of assets to ensure the results accorded with common sense and provided enough segregation between assets to be useful for prioritising work..

Marchment Hill built reporting tools to allow clear presentation of the results to Board, Executive and operating levels of the business. The key requirements of the Board reports were simplicity and transparency with respect to the risks the business faced and progress in addressing them, while lower levels called for a more granular view.

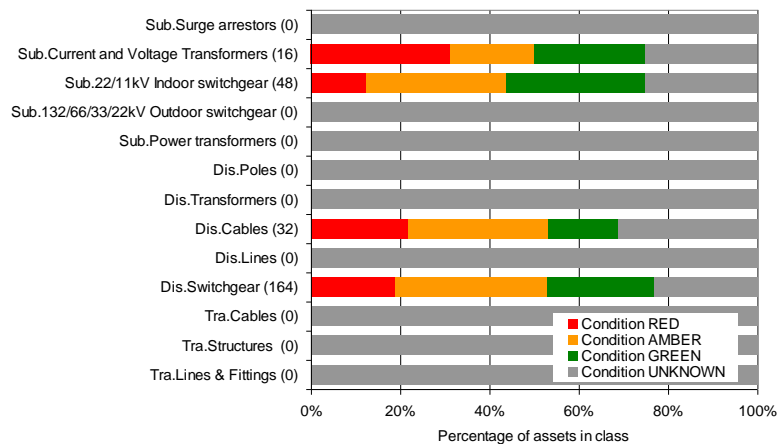


Figure 8: Example of a Board-level report, summarising asset condition according to asset class and location. Note the grey areas, signifying condition unknown.

MARCHMENT
HILL *consulting*

Marchment Hill Consulting has offices in three locations which serve Australia and New Zealand, Asia and the Middle East.

Melbourne

Level 4
530 Lonsdale Street
Melbourne Vic 3000, Australia
Phone: +61 3 9602 5604
Fax: +61 3 9642 5626

Brisbane

Level 24, AMP Place
10 Eagle Street
Brisbane Qld 4000, Australia
Phone: +61 7 3303 0264
Fax: +61 7 3303 8445

Hong Kong

Level 39
One Exchange Square
Central Hong Kong
Phone: +85 2 3101 7948
Fax: +85 2 3101 7949

marchmenthill.com

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