



HOW TRANSPOWER MANAGES RISK, SERVICE AND ASSETS FOR NEW ZEALAND

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TRANSPOWER

A wide-angle photograph of a rural landscape. In the foreground, a gravel road curves from the bottom left towards the center. A tractor is parked on the road, facing away from the camera. The middle ground features rolling green hills under a clear blue sky. A bright sun is positioned in the upper left, creating a lens flare. Several high-voltage power lines stretch across the sky, supported by a tower in the distance. The overall scene is bright and clear, suggesting a sunny day.

RISK BASED ASSET MANAGEMENT

CONTEXT

- Depreciated asset base – for example 60% of our conductors were installed between the 1950's and 1980's
- Accelerated electrification – enabling NZ to achieve net zero carbon will mean infrastructure upgrades
- Changing in transmission pricing methodology to beneficiary pays could magnify energy affordability issues for parts of NZ
- Economics of non-network alternatives improving rapidly
- “Energy trilemma” of affordability, sustainability and security is not going away and expectations of efficiency to offset upgrades
- Regulated SOE with a five yearly reset

CHANGE DRIVERS

- Price path – dividend – risk is a balancing act
- With increased replacement needs we need to be:
 - Mindfully prudent
 - More data driven
 - More systematic
 - Transparent in decision-making
 - Cognisant of future need
 - Able to value relative risk
 - Understand service definition – what is an economic service?
- How much further we can reduce risk levels for the \$\$ we invest?

OBJECTIVE

What are we required to achieve?

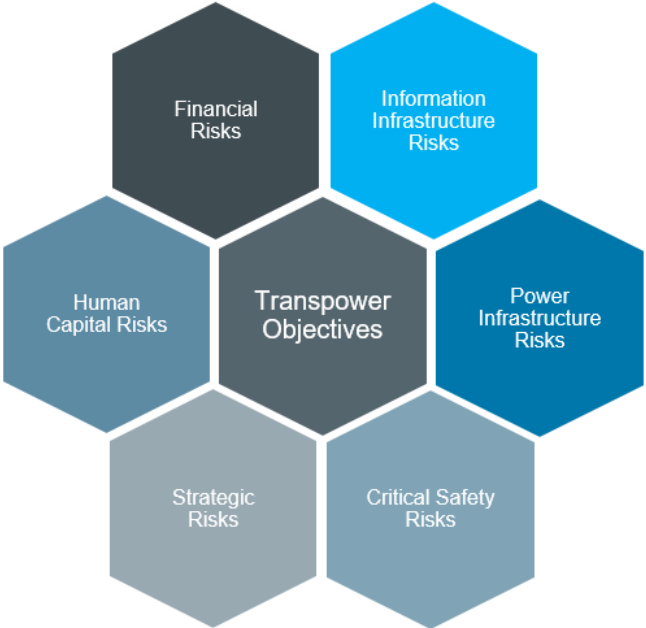
- Deliver economically justified asset management to meet strategic objectives
- Demonstrate least lifecycle costs at acceptable risks for our grid assets
- Create long term value through innovative grid planning

What does good look like for a risk-based approach?

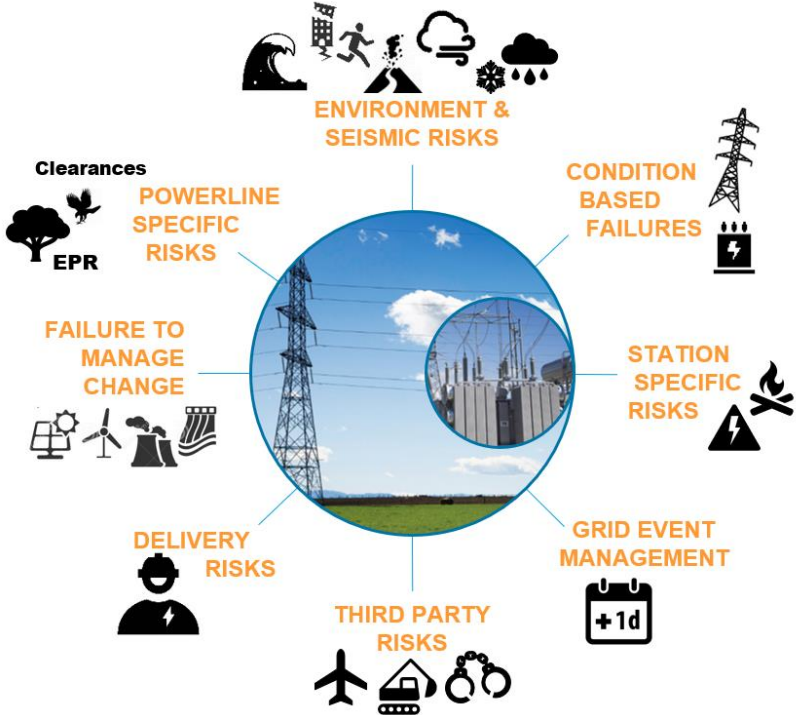
- We understand and communicate asset risks and manage our risks and critical controls. Our risk framework is integrated with the rest of the business
- We can confidently target our investment plans to risks and articulate the connection between grid risk, asset investment plans, and service.

CRITICAL RISKS

TRANSPower CRITICAL RISKS

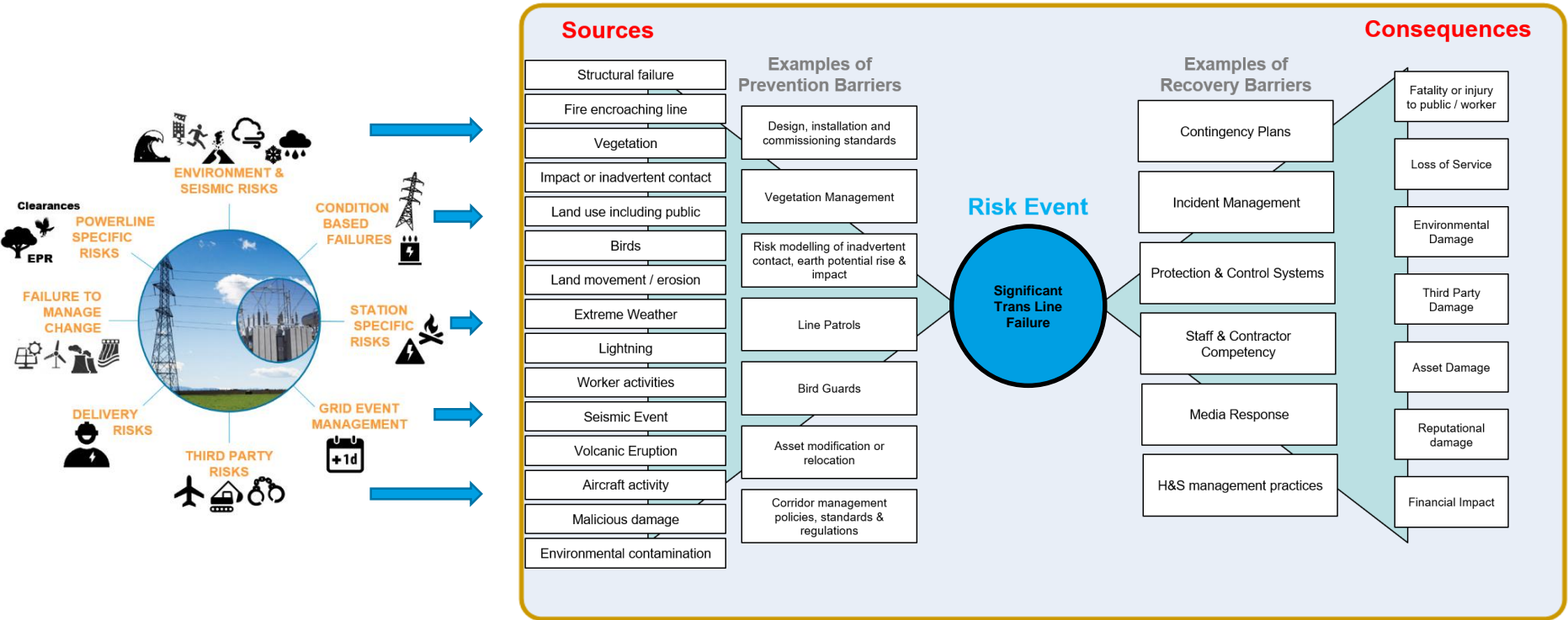


POWER INFRASTRUCTURE CRITICAL RISKS



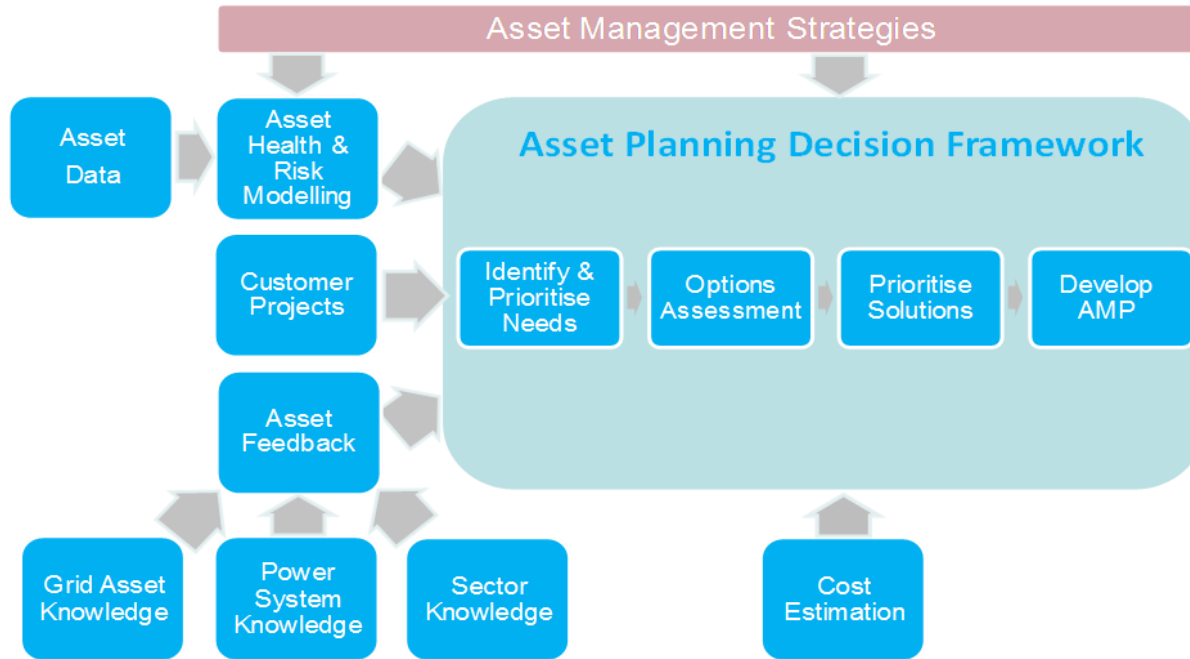
Risk consequences include Service Performance, Public Safety, Worker Safety, Environment and Direct Cost.

RISK SOURCES AND CONTROLS



Risks are based on same level of investment and resource for both maintenance and inspections, and for managing incidents.

ASSET PLANNING DECISION FRAMEWORK



Simplified representation

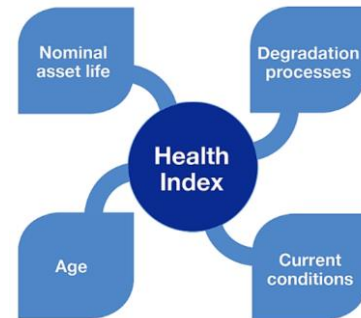
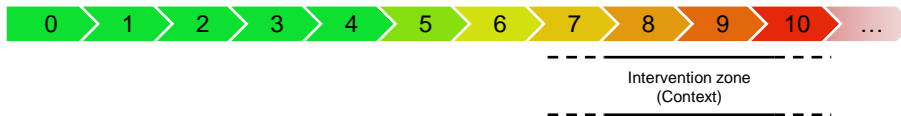
Medium maturity - Refurbishment & replacement plans

Low maturity - Maintenance and contingency plans

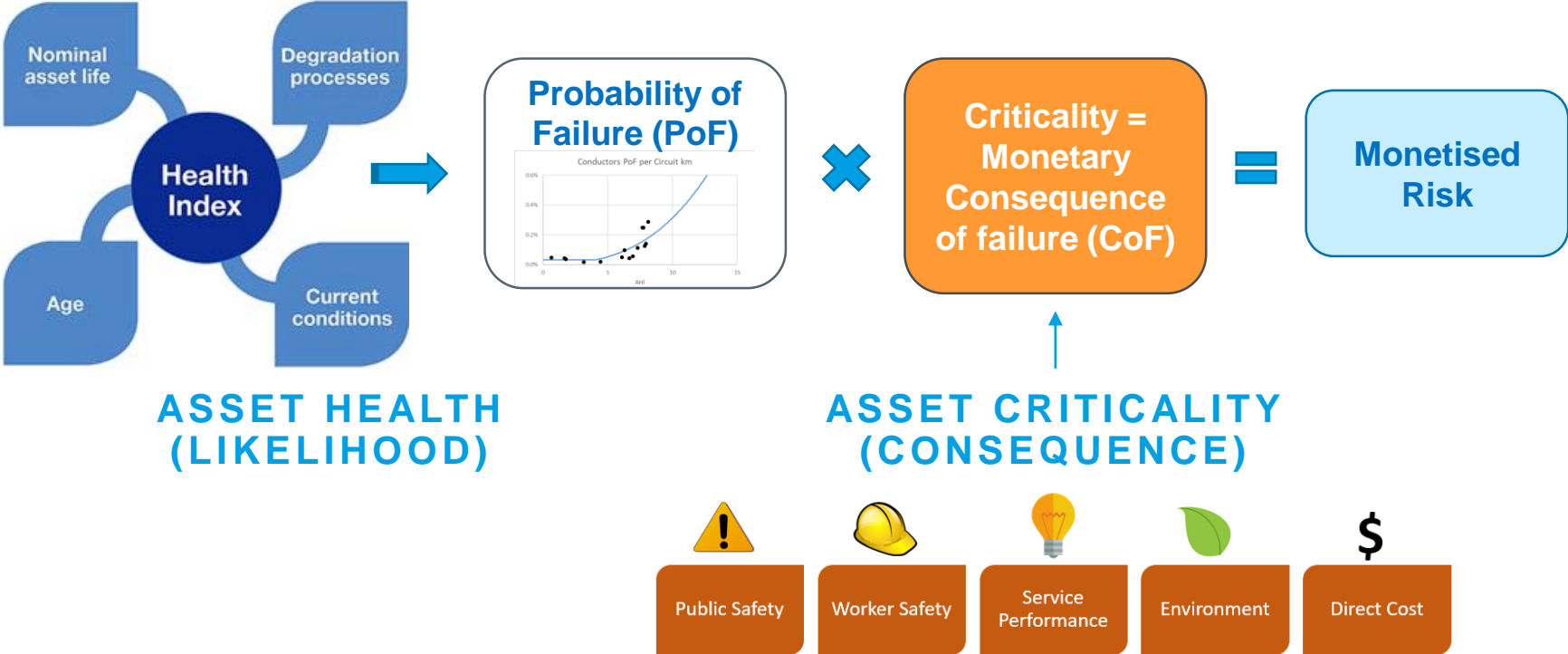
ASSET HEALTH

- Our Condition Based Asset Health Models calculate a score of 0-10 for current asset health and this is an indicator of likely remaining life
- It is a consistent, auditable and logical means of combining complex information and consistent with international practice
- Uses the asset age, nominal life, degradation processes, and current observed and measured condition data to develop current and future Asset Health Index which allows forecast
- Hygiene factor with respect to critical risks – dissatisfaction is high if service is impacted from not maintaining our asset base.
- Outsource model for facilities asset management using SPM
- It is still an area for the industry and Transpower to mature

CONDITION BASED ASSET HEALTH



CONDITION BASED FAILURE RISK



CRITICALITY



Returns		Frequency		CORPORATE RISK ASSESSMENT MATRIX							
0.3 yr	3	Almost Certain	HIGH	HIGH	VERY HIGH	VERY HIGH	EXTREME	EXTREME	EXTREME	EXTREME	
1 yr	1	Very Likely	MEDIUM	HIGH	HIGH	VERY HIGH	VERY HIGH	EXTREME	EXTREME	EXTREME	
3 yrs	0.3	Likely	MEDIUM	MEDIUM	HIGH	HIGH	VERY HIGH	VERY HIGH	EXTREME	EXTREME	
10 yrs	0.1	Possible	LOW	MEDIUM	MEDIUM	HIGH	HIGH	VERY HIGH	VERY HIGH	EXTREME	
30 yrs	0.03	Unlikely	LOW	LOW	MEDIUM	MEDIUM	HIGH	HIGH	VERY HIGH	VERY HIGH	
100ys	0.01	Very Unlikely	VERY LOW	LOW	LOW	MEDIUM	MEDIUM	HIGH	HIGH	VERY HIGH	
300 yrs	0.003	Rare	VERY LOW	VERY LOW	LOW	LOW	MEDIUM	MEDIUM	HIGH	HIGH	
1000 yrs	0.001	Very Rare	VERY LOW	VERY LOW	VERY LOW	LOW	LOW	MEDIUM	MEDIUM	HIGH	

	CONSEQUENCE									
	Insignificant	Negligible	Minor	Moderate	Major	Severe	Critical	Catastrophic		
	\$100,000	\$500,000	\$1,000,000	\$5,000,000	\$10,000,000	\$50,000,000	\$100,000,000	\$500,000,000	\$1,000,000,000	
	0.05min	0.3min	0.3min	3min	3min	30min	30min	30min	100min	
First Aid Injury or Pain & Discomfort	Medical treatment injury (MTI)	Medical treatment injury (MTI)	Lost Time Injury (LTI)	Serious harm or serious injury or illness	Fatality or permanent disabling injury or illness	Multiple fatalities or permanent disabling injuries or illness	Multiple fatalities or permanent disabling injuries or illness	Multiple fatalities or permanent disabling injuries or illness	Multiple fatalities or permanent disabling injuries or illness	
First Aid Injury or Pain & Discomfort	Medical treatment injury (MTI)	Medical treatment injury (MTI)	Lost Time Injury (LTI)	Serious harm or serious injury or illness	Fatality or permanent disabling injury or illness	Multiple fatalities or permanent disabling injuries or illness	Multiple fatalities or permanent disabling injuries or illness	Multiple fatalities or permanent disabling injuries or illness	Multiple fatalities or permanent disabling injuries or illness	
Short term damage to small area of limited significance	Pollution beyond TP1	Pollution beyond TP1	Pollution beyond TP2	Medium to long term environmental damage	Long term serious environmental damage and/or degradation, difficult restoration	Major widespread environmental release or damage and/or degradation, difficult restoration	Major widespread environmental release or damage and/or degradation, difficult restoration	Long term serious environmental damage and/or degradation, difficult restoration	Irreversible widespread environmental damage and/or degradation	
Non-compliance or minor breach of regulation or other contract / obligation	Breach of regulation or other contract / obligation with penalty	Major breach of regulation or other contract / obligation with penalty	Breach of regulation with penalty or financial implications	Breach of regulation with penalty or financial implications	Investigation by Office holder or Agency	Investigation by Crown / Shareholder / Agency	Investigation by Crown / Shareholder / Agency	Public Inquiry or loss of core function such as System Operator	Loss of license to operate	
Sustained adverse local media coverage	Adverse national media coverage	Sustained adverse national media coverage	Short term international adverse media coverage	Sustained international adverse media coverage	Sustained international adverse media coverage	Minister consistently upholds major complaints from stakeholders	Minister consistently upholds major complaints from stakeholders	Minister consistently upholds major complaints from stakeholders	Minister consistently upholds major complaints from stakeholders	

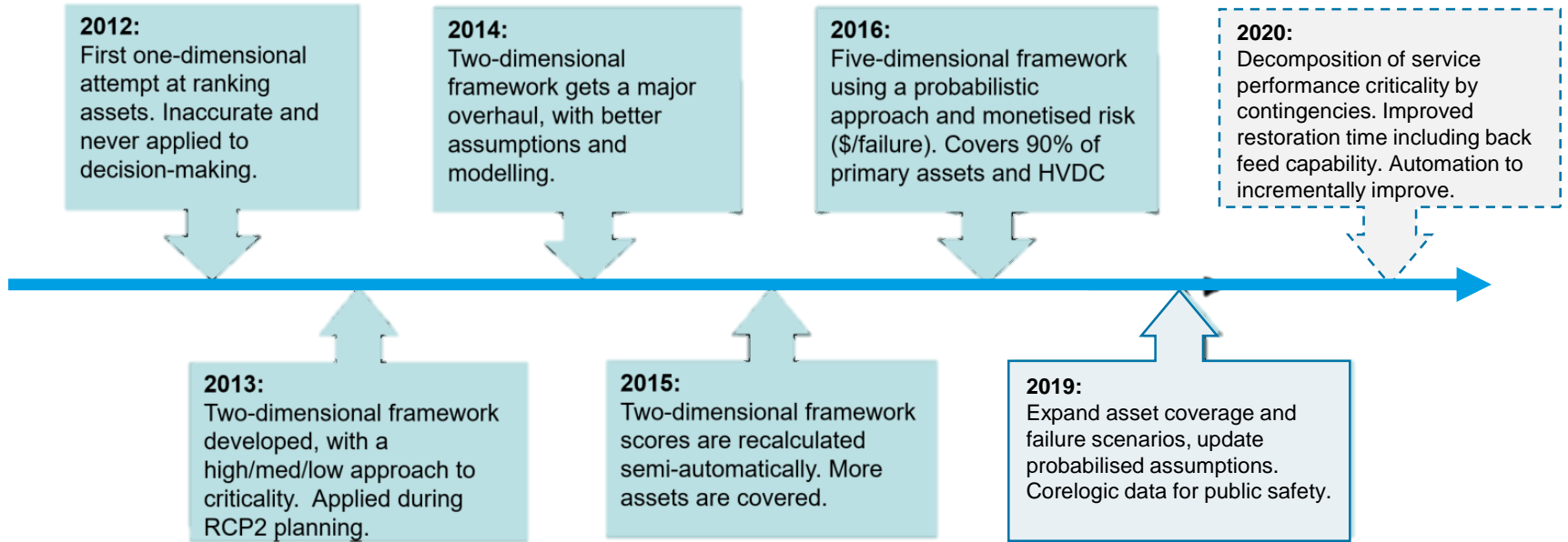
We use the corporate risk matrix to compare and monetise different kinds of risk...

Probabilise consequence of a major asset failure across 5 dimensions

Societal costs such as:

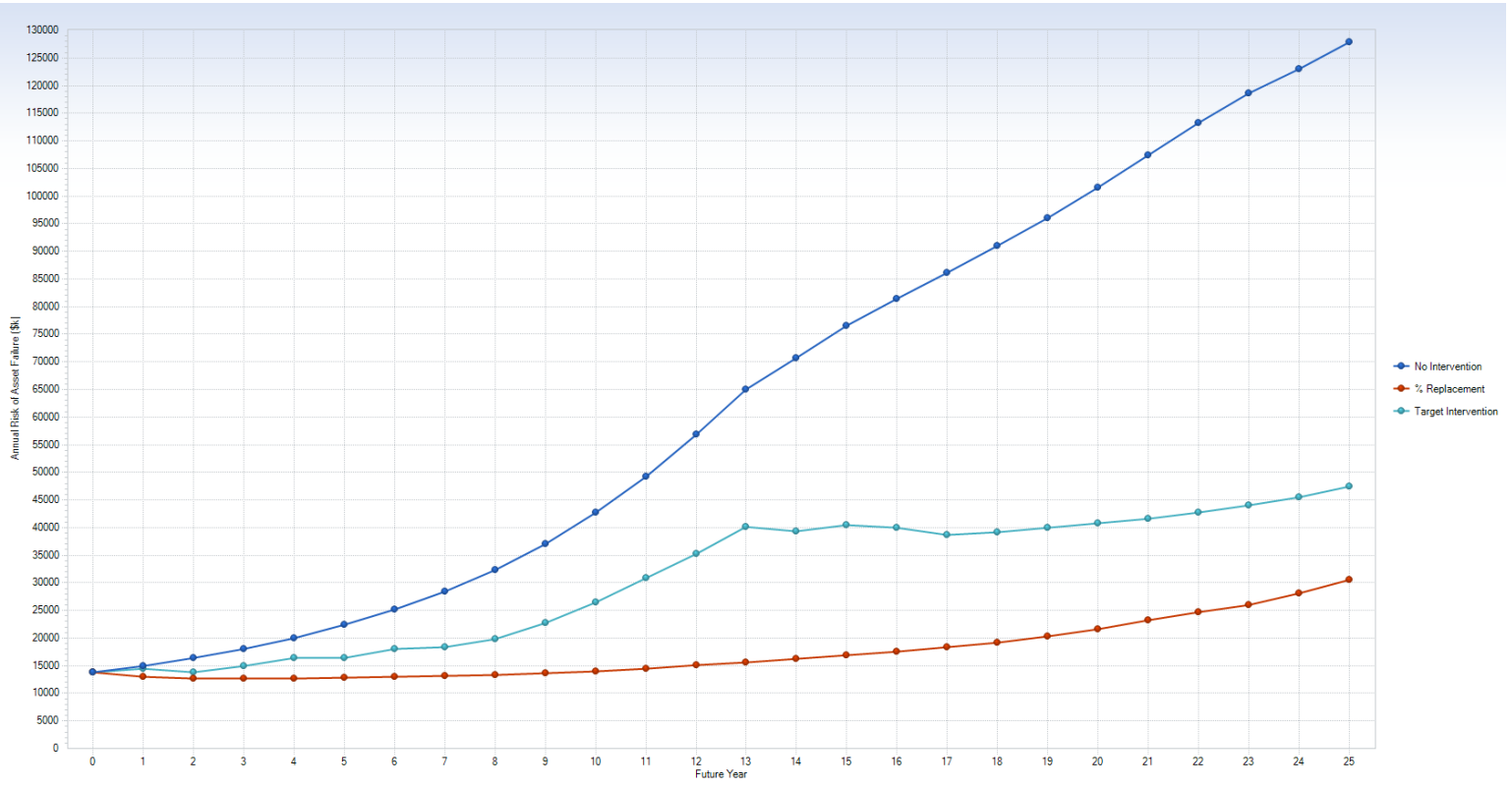
- Economic loss due to probabilised unserved energy using our power system models
- Economic impact from serious harm or fatality from public safety using GIS queries

CRITICALITY FRAMEWORK CHRONOLOGY

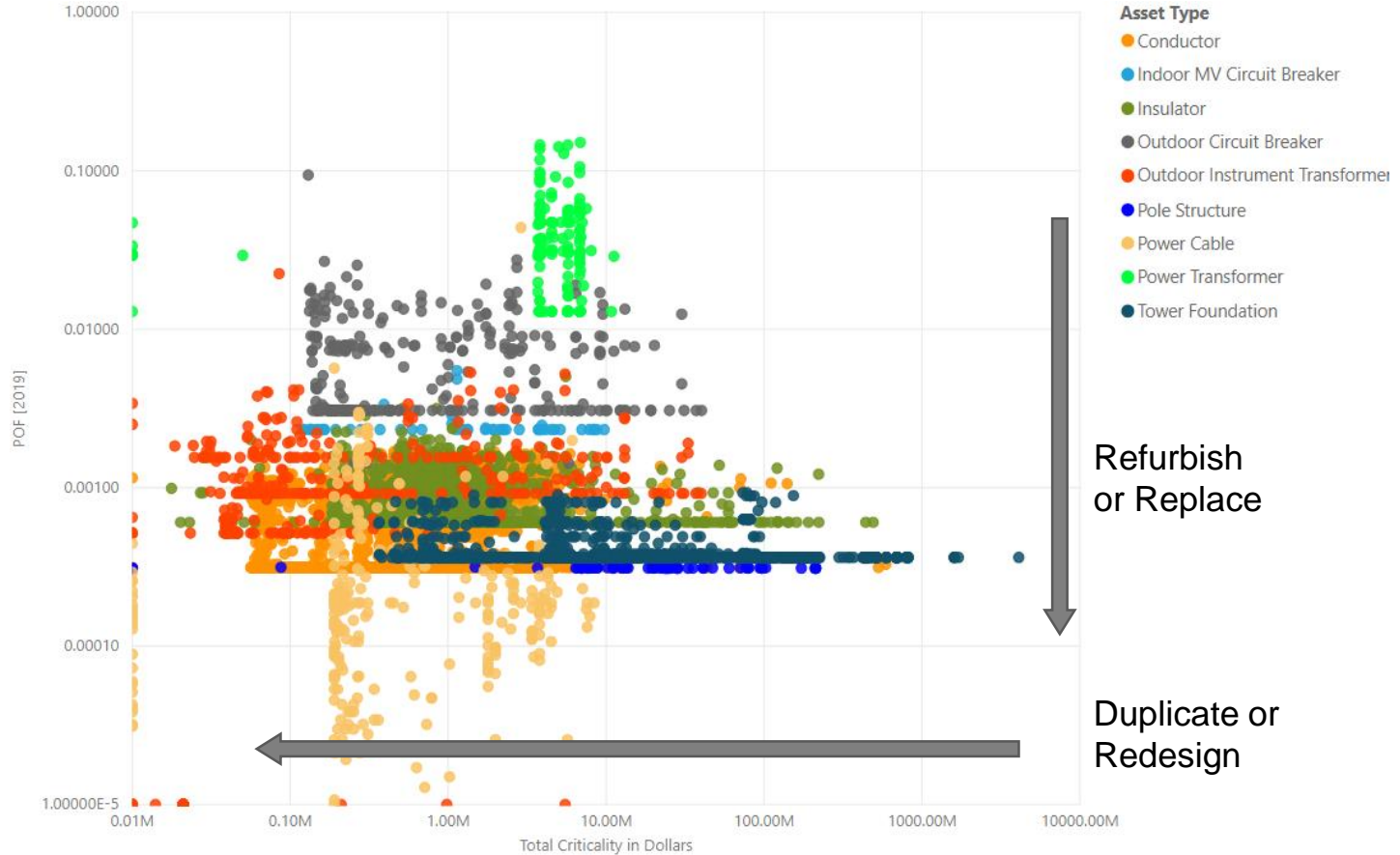


- It is a maturity journey - we had a similar journey for Asset Health
- Taking your teams through the journey is part of the change management
- It helps to understand what others are doing but focus on the next practical step

PORTFOLIO INVESTMENT IMPACT

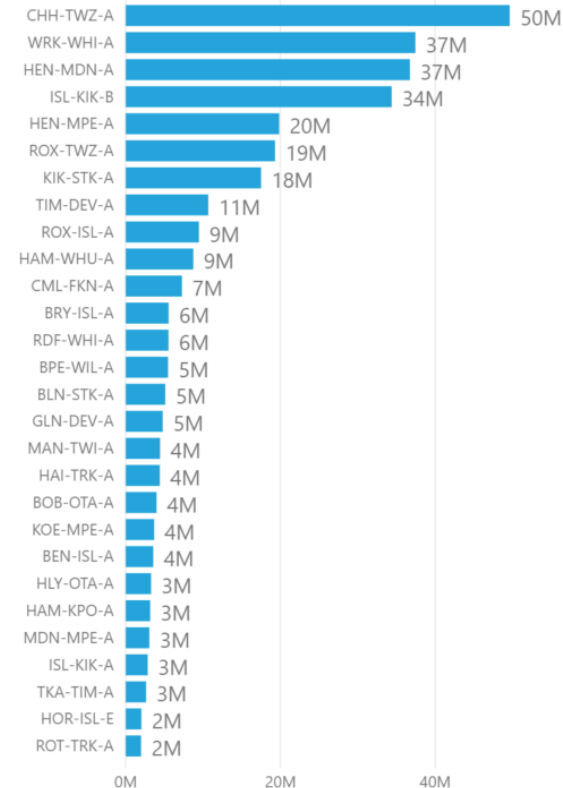


CONDITION BASED FAILURE RISK VISUALISED

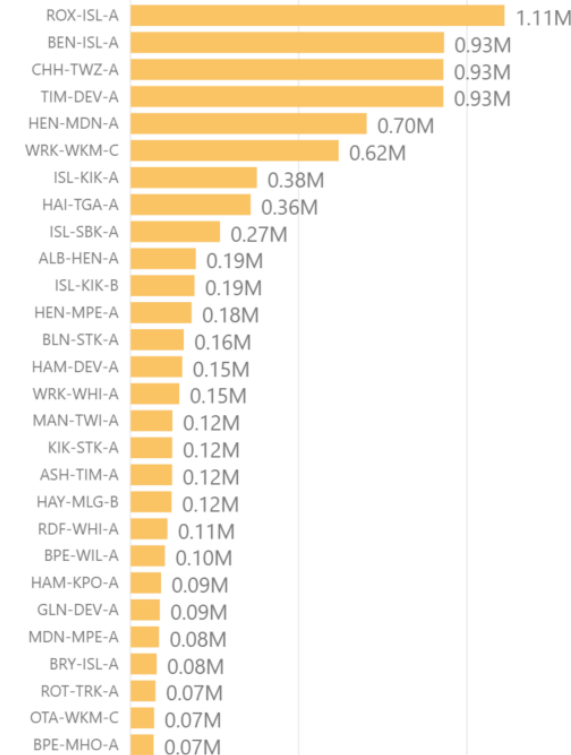


AGGREGATING ANNUALISED RISK

Current Yr Risk (Sum) - Lines



Current Yr Risk (Max) - Lines



The CBRR enables us to view asset health related risk over time at asset level, asset class, station, service area, region and the whole network.

Includes future RCP3 interventions.

Risk is likelihood x consequence.

What are the Transmission Lines with the most risk?

Do we sum all the asset risks, or look at the highest risk span/structure?

What about other risks beside condition based failures?

MAJOR HAZARDS

Still developing an understanding of major hazard risks at site level.

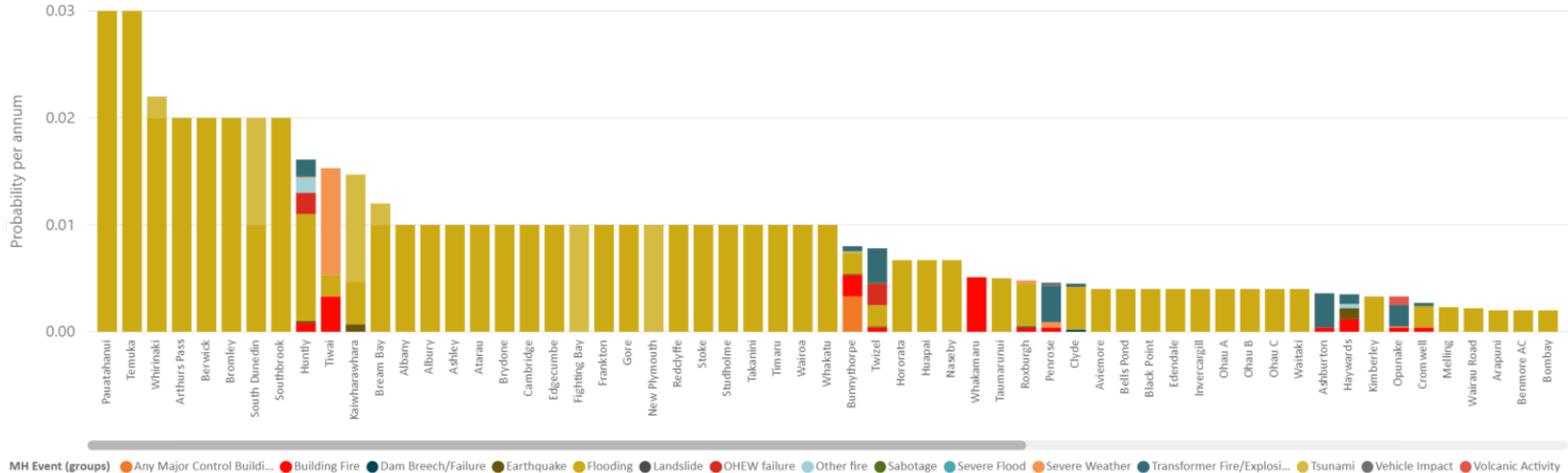
Estimated substation flooding return periods, seismic performance, volcanic risks.

Starting to understand how much climate change will amplify some of these risks.

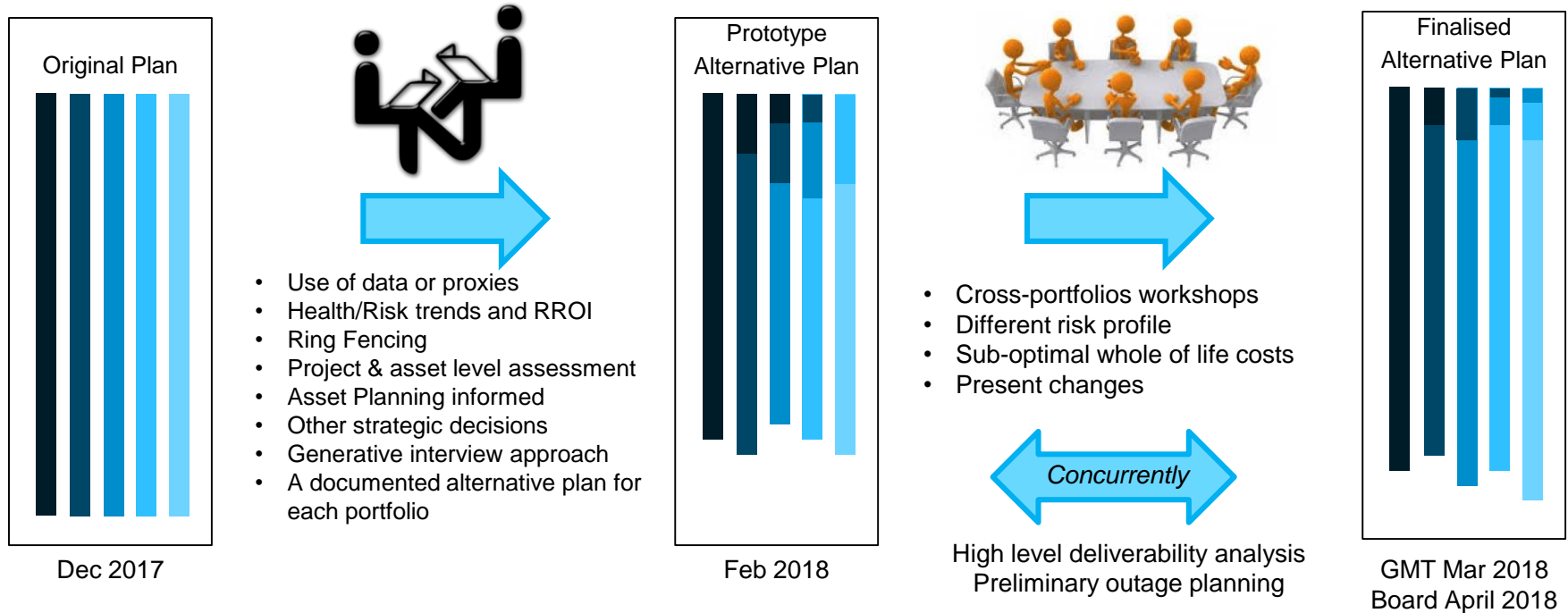
Mitigation options are often only viable if the timing also mitigates other risks.

Risk reduction options including contingency plans and spares.

Major Hazard - Probability by Site & Event



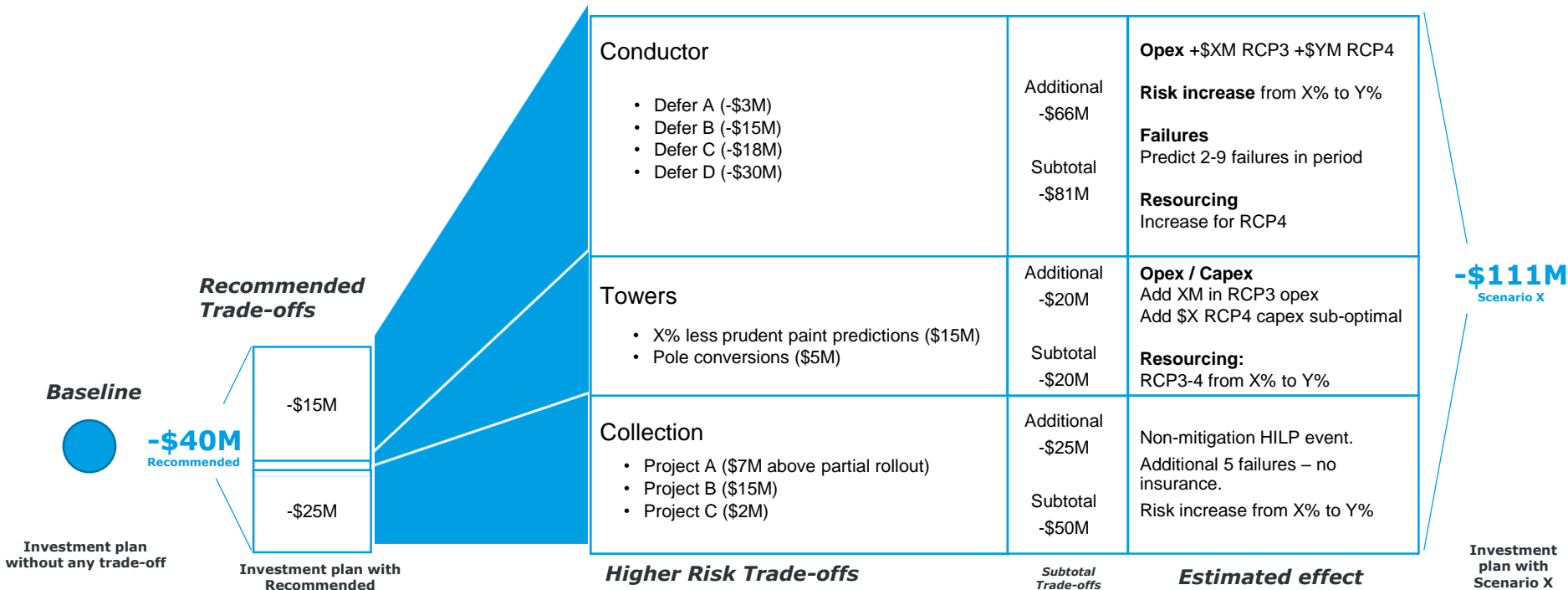
SOLUTION PRIORITISATION PROCESS TO DEVELOP ALTERNATIVE PLAN FOR RCP3



The process used for our last regulatory price submission.

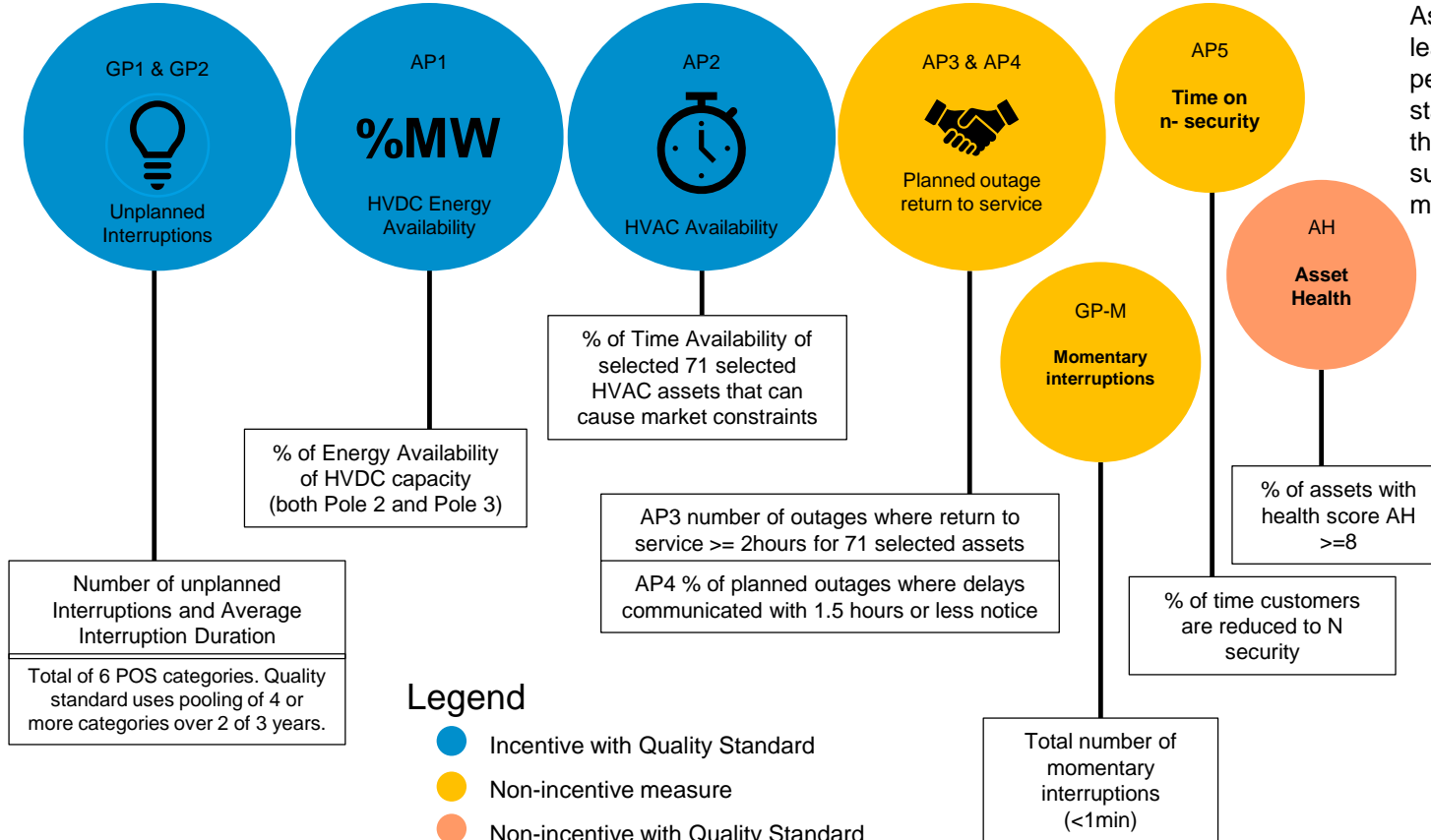
How can we develop alternative trade-offs for the next submission?

PRICE-QUALITY TRADE OFF



- Robust bottom-up challenge but how to consult with customers/regulator?
- Monetised risk not as tangible as service impact.
- Too bottom up, what are the top-down questions for Price-Quality?

OUR SERVICE MEASURE INCENTIVES



Asset health measures are lead indicators for service performance, providing our stakeholders with a view of the state of our assets and support sustainable management of the grid.

PERFORMANCE

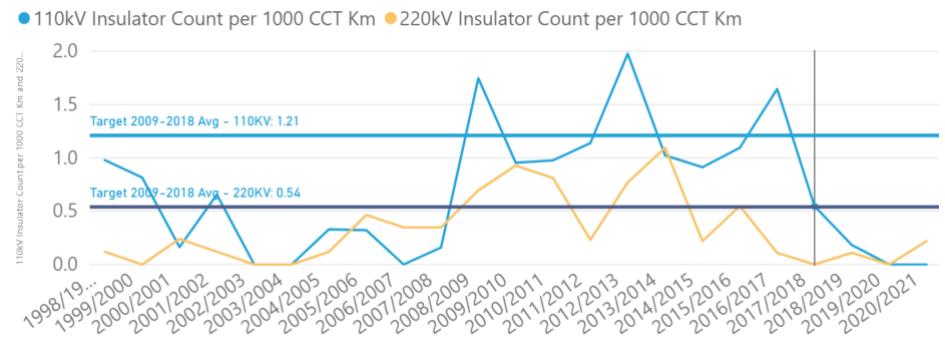
Event recording and reporting supports:

- Service measures
- Asset class metrics
- Probability of failure curves
- Strategy reviews
- Reliability reviews

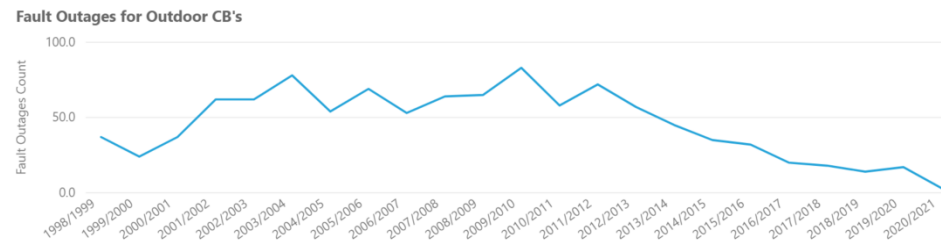
Updates presented to our regulator every 6 months and performance shown within our yearly Asset Management Plan.



Grid performance.



Insulator performance.



Outdoor Circuit Breaker performance.

CUSTOMER ENGAGEMENT AND PRICE-QUALITY

- Linking our grid output expectations to planning is complex - we are on a maturity journey
- Network performance influenced by built configuration of the network and built standard of grid assets - Limited scope to alter the configuration in any 5-year period due to long life of grid assets.
- From a planning perspective, we can influence how we prioritise asset maintenance and replacements, plan work packages and timing, and prepare for events.
- Customer surveyed Value of Lost Load (VoLL) is a common input to decision making. It enables us to categorise connections, set incentive strengths, and is a core parameter of our asset criticality to determine monetised service performance risk.
- Service quality is not easy to communicate in risk dollars, whilst reliability performance is.
- A proportion of the results within our performance measures are practically beyond our control. There are causes to interruptions, such as wilful damage and extreme weather, that are difficult to predict and expensive to mitigate across the entire grid.
- Correlation between investment and performance impact can be variable. We need to show the service impact of our investments with the context of normalised long term averages.

CURRENT & EMERGING (*) APPLICATIONS

Needs Identification

- Asset Health and Asset Criticality
- Resilience and climate change using major hazards*

Options Analysis

- Risk based investment – wait and see, refurbishment versus replace
- Asset life extension models – where to extend life and how to now by how much
- Risk studies and service level impacts*

Solution prioritisation

- Scenario testing for price-quality trade offs including consultation*

Maintenance

- Risk tools to prioritise defect management and identify areas for preventative maintenance reviews
- Contingency toolbox*
- Risk based asset standards*

EXTERNAL SCANS

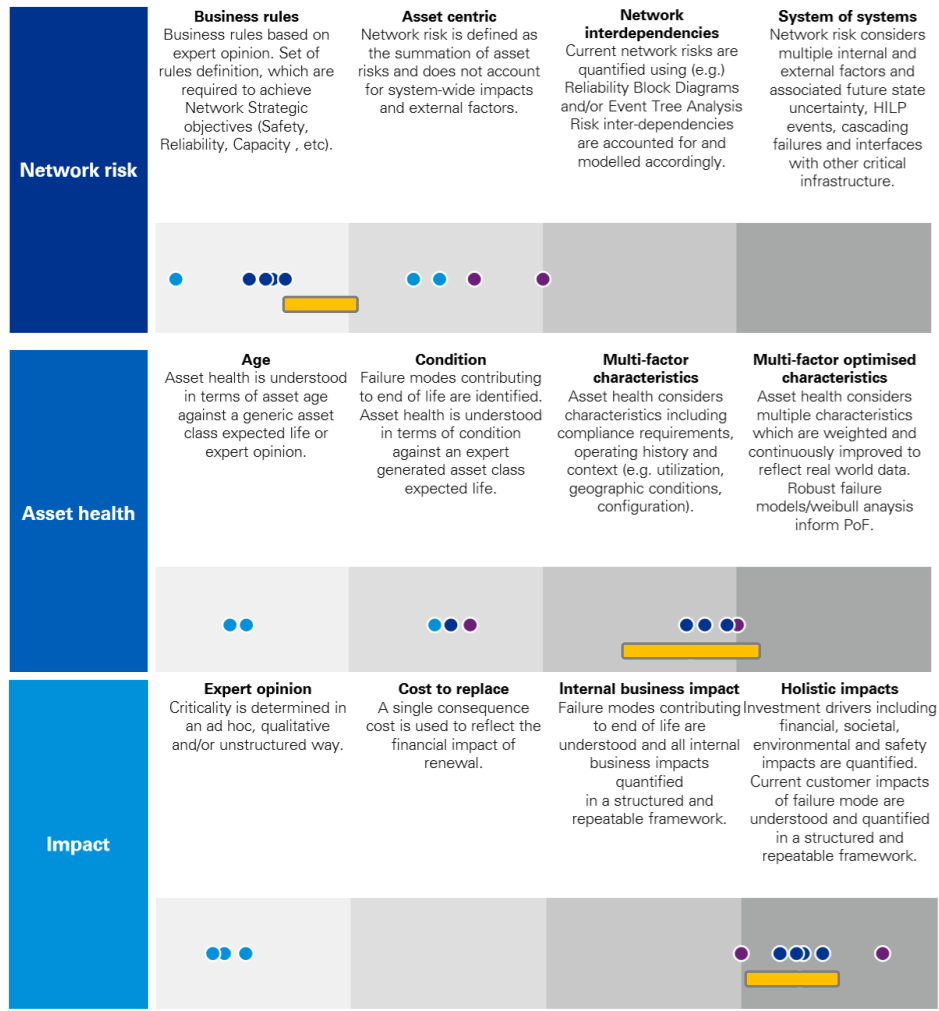
KPMG: Asset Health & Network Risk report

Other utilities and regulators

- UK (+Euro?)
- Australia
- Canada
- Industry groups/partners

Enablers:

- Data
- Technology
- Customer Engagement
- Processes



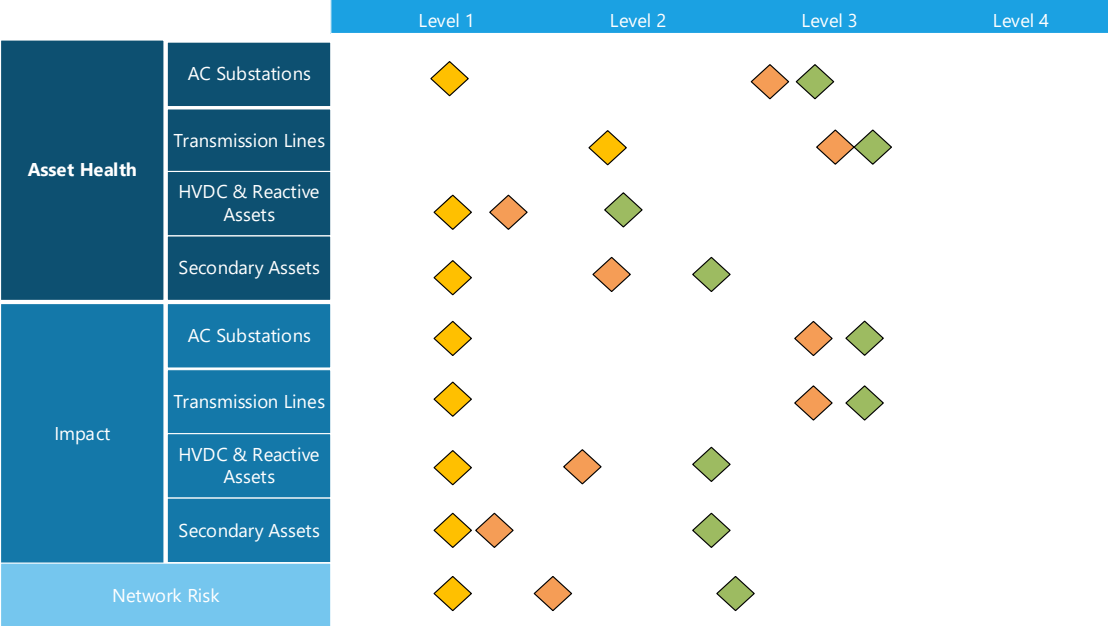
OPPORTUNITIES AND CHALLENGES

WHAT NEXT?



MATURITY PROGRESSION

Significant Our Condition Based Asset Health Models calculate a score of 0-10 for current asset health and this is an indicator of likely remaining life

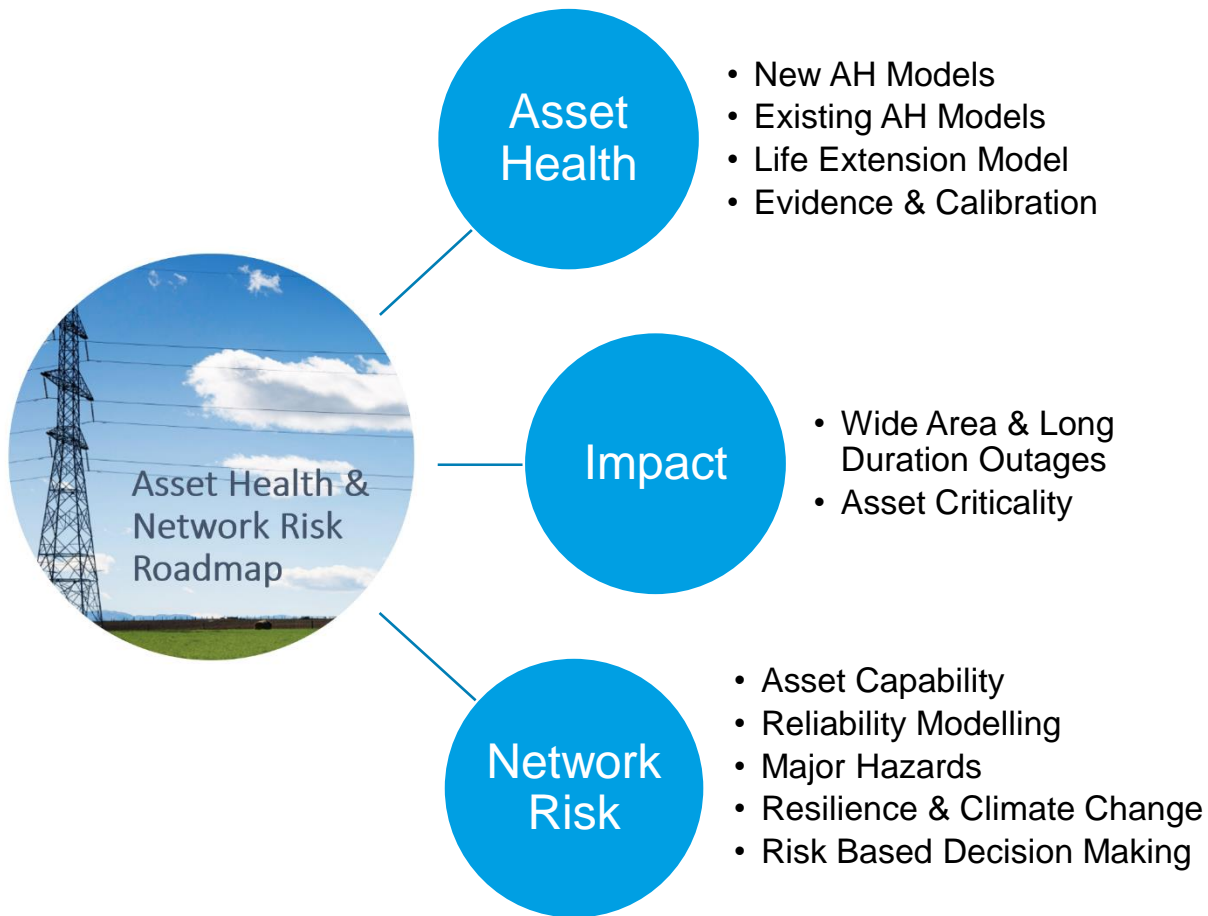


Legend

- ◆ RCP2
- ◆ RCP3
- ◆ RCP4

Maturity model from KPMG adapted for Transpower.
 Self assessment for majority of asset types within group.
 Indicative progression at time of regulatory control period submission.

ROADMAP



RISK AND SERVICE

Over the next 5 years (to be ready for our next reset) we need to create a stronger link to service in decision-making – consider:

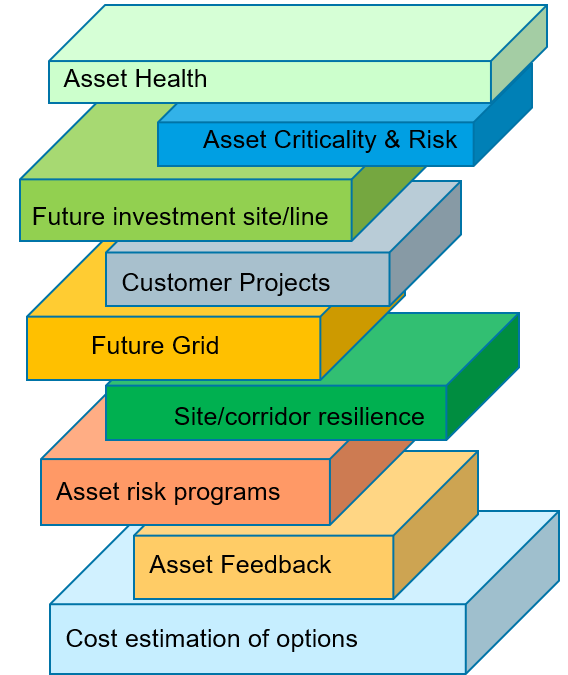
- Linking service impacts to price-quality scenarios (different investment options)
- Understanding economical service levels at a point of service
- Communicate risk of price-quality scenarios (different investment options)
- Develop capability to communicate our resilience and climate change risk
- Develop capability to develop funding or identify resilience programs and projects
- Communication in a way that deals with the complexity in simple terms

Our work on network risk and reliability modelling is aimed at developing this capability.

INTEGRATE OUR PLANNING FURTHER

- Beyond the 'asset class' approach (an approach that has seen the reliability of the grid improve)
- Consider risk at a network and point of service level
- Consider risk more widely than degradation
 - future grid
 - climate change
 - asset specific risks
 - resilience/major hazard

This allows us to undertake incremental replacement and improvement whilst not missing opportunities to consider the wider context and opportunities to plan for future risks.



The information stack to inform integrated planning.

CHALLENGES

- Industry and customer engagement
- Executive and Board engagement and awareness
- Technology and integration of information and systems
- Risk is not exact – cultural change
- Data quality and construct – skills and investment
- Communication of output – what to consult on e.g. public safety versus service reliability

DISCUSSION

