

# Asset Health and Criticality

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Application of Asset Health and Criticality Assessment at Genesis Energy

Michael Eschenbruch | Reliability Engineer



# A bit about myself and an Agenda

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## About Me

- Reliability Engineer at Genesis Energy
- Have been involved heavily on our asset management journey
- Currently focused on data warehousing and turning our asset data into information

## Agenda

- ISO 55000
- Genesis Energy Asset Management Plans
- Asset Health
- Asset Criticality
- Asset Ranking
- Questions



# ISO 55000 and AM at Genesis Energy

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- Establish an asset management system to optimally manage assets
- Doesn't explicitly state how you should run asset management and an asset management system, rather what aspects need to be covered
- Genesis Energy is aligned to 55000, internally audited
- Our high level processes/documents that capture the majority of our asset management information;
  - Bowties (process safety)
  - Equipment Asset Management Plans (fleet management)
  - Scheme Business Plans (site management)

# Asset Management Plans

- Double sided A3 document that captures high level information, refers to underlying systems for detailed information (eg bowties, project planning system, document management system, CMMS)
  - Equipment Asset Management Plans (fleet management)
  - Scheme Business Plans (site management)

# Asset Health

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- Overall level of functionality or efficiency of an asset considering;
  - Percentage of asset age/life cycle stage
  - Operation and maintenance history
  - Operational/performance restrictions
  - Physical condition
  - Spares availability/accessibility
- Factors weighted according to asset type, engineers decision
- Calculates a value; 5 to 1; Excellent to Unserviceable
- Managed in an online spreadsheet

# Asset Health Overview

## Power Station / Location

(Blank)	All Generation	Huntly - All	Huntly - Rankine
Huntly - U5	Huntly - U6	Kaitawa	Mangaio
Piripaua	Rangipo	Tekapo A	Tekapo B
Tokaanu	Tuai		

## Discipline

Civil	Control Systems	Electrical	Mechanical
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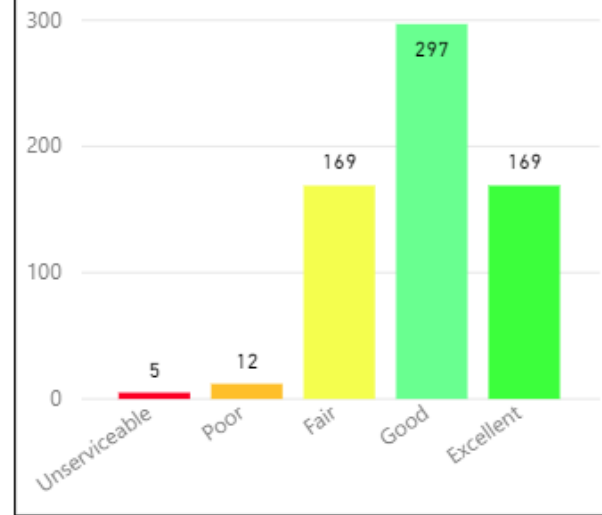
## Equipment / EAMP Type

Ancillary Sys...	Ash Plant	Boiler and H...	Buildings - O...	Cables and ...	Coal and PF ...	Communicati...
Compressed...	Cranes and ...	Dams	DC Systems ...	Diesel Gener...	Drainage an...	EHV Distribu...
Feedwater	Field Instrum...	Fire Systems	Fuel Gas Sy...	Gas System...	Generator Pr...	High Energy ...
Hydro Contr...	Hydro Coolin...	Hydro Gener...	Hydro Turbin...	Liquid Fuel S...	Low Pressur...	LV and HV D...
Motors	Overhead Li...	Penstocks	Roads, Drain...	Screen clean...	Shafts and U...	Systems Arc...

## Equipment Health by Health Description



## Equipment Health by Health Description



## Month Updated

May 2018

Power Station/ Location	Unit	Equipment/ EAMP	Functional Group/ Subgroup	Component	Equipment Score	Current Equipment Health	Age	Operation and Maintenance History	Operational Performance/ Restrictions	Physical Characteristics/ Condition	Spares Availability
	Huntly	Roads, Drainage and B...	Bridges		Good	4.00	4.00	4.00	4.00	4.00	2.00
	Huntly	Roads, Drainage and B...	Roads and Drains		Fair	3.20	4.00	3.00	3.00	3.00	2.00
	Poutu Canal	Roads, Drainage and B...	Roads and Drains		Fair	2.60	4.00	3.00	2.00	2.00	2.00
	Tekapo	Roads, Drainage and B...	Bridges		Good	4.00	4.00	4.00	4.00	4.00	2.00
	Tekapo	Roads, Drainage and B...	Roads and Drains		Good	3.70	4.00	4.00	3.50	3.50	2.00
	Tongariro	Roads, Drainage and B...	Bridges		Good	3.67	4.00	4.00	3.00	4.00	2.00
	Tongariro	Roads, Drainage and B...	Roads and Drains		Good	3.80	4.00	3.00	4.00	4.00	2.00
	Waikaremoana	Roads, Drainage and B...	Bridges		Fair	3.33	2.00	4.00	3.00	4.00	2.00

# Asset Criticality

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- Impact to the business should the asset fail to perform the function for which it has been designed
- Utilise our corporate risk consequences;
  - Health and safety
  - Environment
  - Financial/gross margin impact
  - Reputation
- Weighted accordingly (management decision)
- Managed in an online spreadsheet

# Asset Criticality Overview

## Power Station / Location

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Piripaua	Rangipo	Tekapo A	Tekapo B
Tokaanu	Tuai		

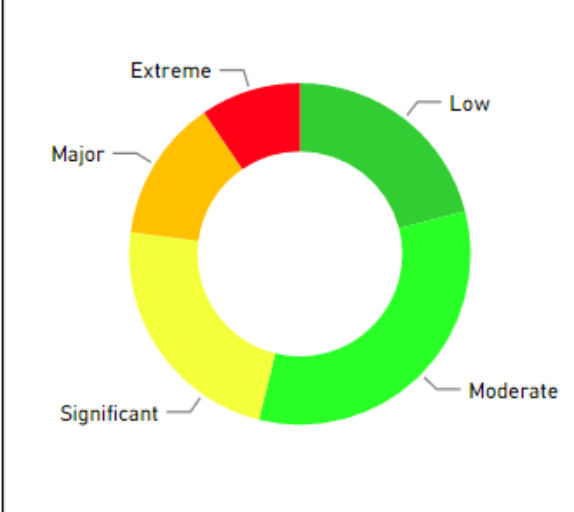
## Discipline

Civil	Control Systems	Electrical	Mechanical
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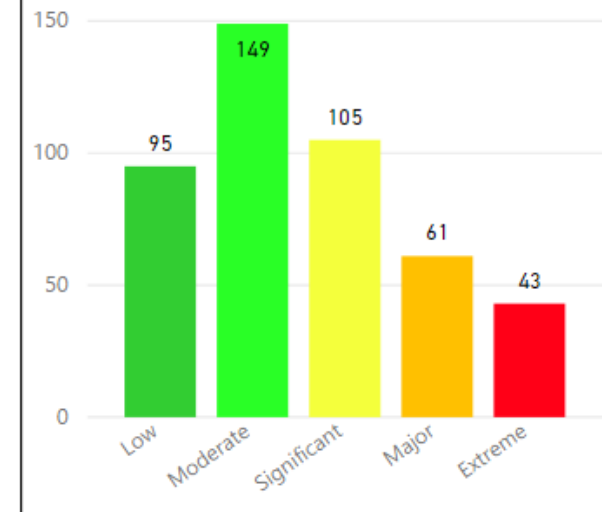
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Compressed...	Cranes and ...	Dams	DC systems ...	Diesel Gener...	Drainage an...	EHV Distribu...
Feedwater	Field Instrum...	Fire Systems	Fuel Gas Sys...	Gas Systems...	Generator Pr...	High Energy ...
Hydro Contr...	Hydro Coolin...	Hydro Gener...	Hydro Turbin...	Liquid FuelS...	Low Pressur...	LV and HV D...
Motors	Overhead lines	Penstocks	Roads, Drain...	Screen Clea...	Shafts and U...	Systems Arc...

## Equipment Health by Health Description



## Equipment Health by Health Description



Power Station/ Location	Unit	Equipment/ EAMP	Functional Group/ Subgroup	Criticality	Criticality Score	People Safety	Environmental	Gross Margin	Reputation
	Wairehu	Screen Cleaners		Low	0.75	0	1	0	0
Huntly - Rankine	Common services	Transformer - Other		Moderate	1.75	3	2	0	1
Huntly - Rankine	Common services	DC systems and UPS		Significant	2.25	2	0	3	1
Huntly - U5		Field Instruments		Extreme	4.75	4	3	5	4
Huntly - U5	5	Transformer - Other		Major	3.75	3	2	5	1
Huntly - U5	Common services	DC systems and UPS		Significant	2.75	2	0	4	1
Huntly - U6		Field Instruments		Significant	2.25	4	3	0	4
Huntly - U6	6	Transformer - Other		Significant	2.25	3	2	2	1
Huntly - U6	Common services	DC systems and UPS		Low	0.75	2	0	0	1
Kaitawa		Field Instruments		Significant	2.75	4	3	1	4



# Asset Ranking

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- Visual representation of asset health and criticality to highlight the importance of different assets and different locations
- Compares apples with oranges
- Helps tell the story of health of assets and where we are forecasting capital spend

# Ranking Chart

Scheme: All

Power Station/ Location: Huntly - U5

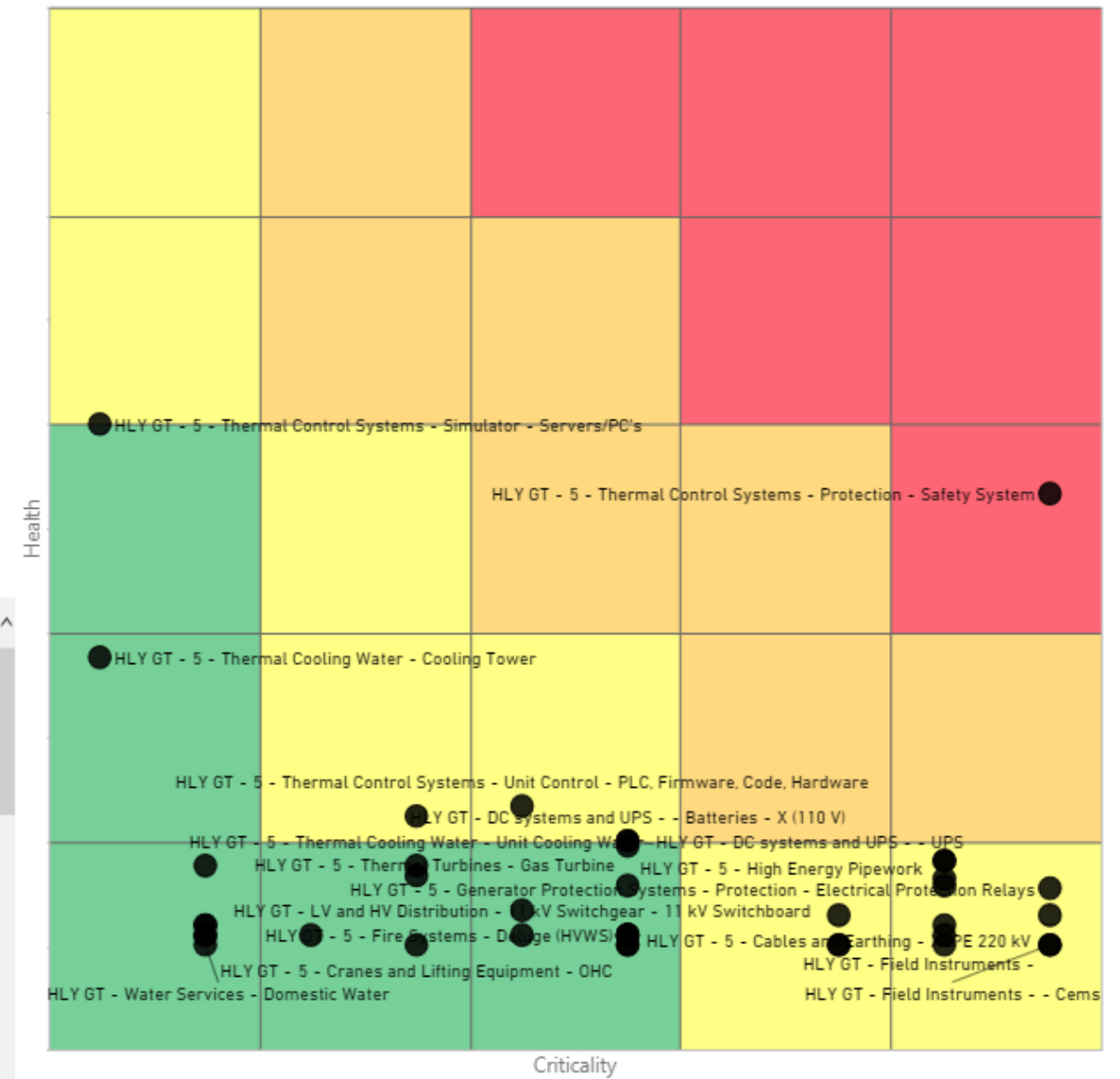
Unit: All

Equipment/ EAMP: All

Functional Group/ Subgroup: All

Component: All

Scheme	Power Station/ Location	Unit	Equipment/ EAMP	Functional Group/ Subgroup	Component	Equipment Health	Criticality
Huntly	Huntly - ...	5	Thermal Contr...	Simulator	Servers/PC's	2.50	0.25
Huntly	Huntly - ...	5	Thermal Coolin...	Cooling Tower		3.62	0.25
Huntly	Huntly - ...	5	Motors	Boiler Feed Pump ...		4.90	0.75
Huntly	Huntly - ...	5	Motors	Condensate Extrac...		4.62	0.75
Huntly	Huntly - ...	5	Motors	Gas Compressor ...		4.90	0.75
Huntly	Huntly - ...	Common ...	Buildings - Other	Power Station - Fu...		4.95	0.75
Huntly	Huntly - ...	Common ...	Water Services	Domestic Water		5.00	0.75
Huntly	Huntly - ...	Common ...	Water Services	Stormwater		4.95	0.75
Huntly	Huntly - ...	Common ...	Water Services	Sewerage/Greywa...		4.95	1.25
Huntly	Huntly - ...	5	Cranes and Lifti...	OHC		5.00	1.75
Huntly	Huntly - ...	5	Motors	Cooling Water Pu...		4.62	1.75
Huntly	Huntly - ...	5	Thermal Coolin...	Unit Cooling Water		4.38	1.75
Huntly	Huntly - ...	Common ...	Diesel Generat...	Diesel Generator		4.67	1.75



Points that cannot be plotted

Scheme	Power Station/ Locati...	Unit	Equipment/ EAMP	Functional Group/ Subgro...	Compone...	Criticality Ra
All	All Generation		Systems Architec...	Dispatch system Generatio...		
Huntly	Huntly - All		Communication...			

# Asset Ranking

## — Investment Decision Making

- Asset Ranking (from Health and Criticality scores) reinforces where/why to make investment from a risk perspective.
- Will use rankings pre/post investment to aid with business cases
- Roles back into asset management plans
- Risks and asset ranking detailed and forecasted spend will correspond to ranking chart

### EQUIPMENT ASSET MANAGEMENT PLAN

Technical Review Complete | Approved | 2023-2028

**STATUS**

**Asset Details**

**ASSET RANKING**

Asset ID	Asset Name	Health Score	Criticality Score	Asset Ranking
AS001	Asset 1	High	Low	Green
AS002	Asset 2	Medium	Medium	Yellow
AS003	Asset 3	Low	High	Red

**ASSET DATA**

### ASSET RISK

ASSET RISK MATRIX

Asset ID	Health Score	Criticality Score	Risk Level
AS001	High	Low	Low
AS002	Medium	Medium	Medium
AS003	Low	High	High

**ASSET LIFECYCLE & OPERATING FINANCES**

ASSET INVESTMENT REPORT

### PERFORMANCE TARGETS

ASSET SUPPORT SOFTWARE & SOFTWARE

**ASSET LIMITATION**

**LEGISLATION & REGULATION**

**TECHNICAL SYNERGIES**

**PATRIAL PROPOSED IMPROVEMENTS**

### ASSET SUPPORT SOFTWARE & SOFTWARE

**20-YEAR INVESTMENT PLANNING**

**ASSET RISK MATRIX**

**ASSET RISK MATRIX**

# Future Enhancements

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- Make health assessments quantitative (use of machine learning and data driven calculations)
- Data warehousing – creating a common source of asset related data, want to drive data made decision making
- Criticality to be used to drive WO priority

*Happy to discuss any of these further or how we currently measure health and criticality*



# Questions?

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Thank you

