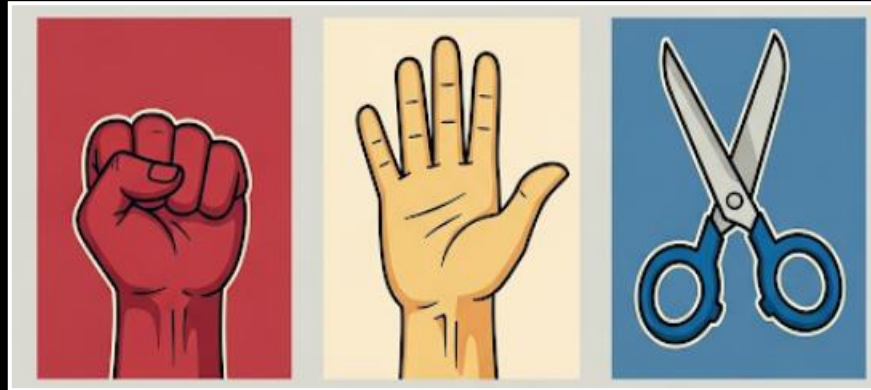


# MAKING THE RIGHT CALL: REPAIR, REPLACE, OR EXTEND ASSET LIFE?

Shantanu Bendre (Yarra Valley Water)



**REPAIR**

**REFURBISH**

**REPLACE**

# PROLOGUE

- As equipment reaches the end of its lifecycle, decisions become increasingly **complex**.
- Complexities in the water industry
  - Service discontinuity
  - Regulatory compliance
  - Environmental and Sustainability Goals
  - Cost and Funding Challenges
- The million-dollar question: repair, refurbish or replace?

# CASE STUDY: SWITCHBOARDS



ORGANISATION

**NO COUNTRY  
FOR OLD MEN**

SWITCHBOARDS

# CHAPTER 1: THE PROBLEM

- Yarra Valley Water (YVW) identified that several of their facilities have electrical installations that may not comply with Australian and YVW standards.
- YVW did not have information on the condition of the asset class from an AS/NZS 3019 lens.

# CHAPTER 2: ECAP

- YVW commences the Electrical Condition Assessment Program (ECAP) for approximately 200 main switchboards (2022-23).
- Yarra Valley Water (YVW) received reports from the contractors that contained the following information –
  - Condition of the asset (IPWEA): A score from 1 (very good) to 5 (very poor)
  - ***Test results of AS/NZS 3019***
  - Hazards associated with the asset and recommended rectification
  - ***NPV analysis***

Table 12 Asset Condition Results Summary

Group	Asset	Condition Assessment Technology (CAT)								
		Visual Inspection – AS Compliance	Visual Inspection – YVW Standard Compliance	Polarity	Polarisation	Insulation resistance	Earth Fault Impedance	Protective device fault rating	RCD verification	Thermography
Power Distribution Circuits	Mains Supply Isolator	✓	✓	✓	✓	N/A	✓	✓	N/A	✓
	Generator Supply Isolator	✓	✓	✓	✓	N/A	✓	✓	N/A	✓
	Pump 1	✓	✓	✓	✓	N/A	✓	✓	N/A	✓
	Pump 2	✓	✓	✓	✓	N/A	✓	✓	N/A	✓
	Pump 3	✓	✓	✓	✓	N/A	✓	✓	N/A	✓
	Pump 4	✓	✓	✓	✓	N/A	✓	✓	N/A	✓
	Pump 5	✓	✓	✓	✓	N/A	✓	✓	N/A	N/A
	Pump 6	✓	✓	✓	✓	N/A	✓	✓	N/A	N/A
	Pump 7	✓	✓	✓	✓	N/A	✓	✓	N/A	✓
	Pump 8	✓	✓	✓	✓	N/A	✓	✓	N/A	✓

Table 15 NPV Analysis for Main Switchboard

ITEM	VALUE
Estimated cost of replacing entire switchboard	\$395,600.00
Estimated Cost of remedial works	\$7,700
Estimated residual book value of switchboard	\$279,722.00
Estimated remaining switchboard life	20 years
Investment period	25 years
Inflation rate	2.5%
Company tax rate	30%
Discount Rate (Cost of Borrowing)	3.76%
NPV of replacing switchboard	-\$676,580.91
NPV of repairing existing Switchboard	-\$500,018.73
NPV saving by performing rectification works	\$176,562.18
Entire switchboard replacement recommended?	No

# CHAPTER 3: NPV ANALYSIS


- Based on the NPV reports, YVW started assessing the switchboards that were flagged to be replaced in the NPV analysis.
- Even though the NPV analysis triggered a replacement, YVW found a **discrepancy** between the NPV advice and the asset condition.
- This discrepancy skewed the organisation's capital renewals program as the switchboards that were flagged for replacement increased significantly.



TYPICAL SEWAGE PUMP STATION MAIN SWITCHBOARD

# CHAPTER 4: THE TOOL

- This triggered a review exercise that led to the creation of the Renewal Assessment Tool.
- This tool weighted and rated the different variables that contributed to the decision of replacing a switchboard –
  - Age
  - Condition
  - Hazards
  - Arc flash rating
  - Site criticality
- One **major difference** in the input of the tool was that the usable age of the switchboard was 49 years, which was based on the empirical data of the existing YVW switchboards.
- The use of the tool changed the CAPEX profiling of the switchboards. As a result, YVW saw fewer switchboards being replaced in a financial year.



## RENEWAL ASSESSMENT TOOL (SWITCHBOARDS)

DEFINITIONS	NOTES	DRIVERS
□	□	□

FACILITY

WPS612

SWITCHBOARD AGE

49

Report

SWITCHBOARD CONDITION

FAIR OR MODERATE

Report

ARC FLASH RATING (LINE SIDE)

CAT 1M

Report

ARC FLASH RATING (LOAD SIDE)

Report

SITE CRITICALITY

LOW

Maximo

HAZARDS (CONTROLLED/STATIC)

1

FACILITY UPGRADE WORKS (PLANNED)

□

UPGRADE WORKS TIME-FRAME

RENEWAL ASSESSMENT OUTCOME

REPLACE

END OF LIFE EXPECTANCY (YEAR)

2022

KEY OUTCOME DRIVERS

Switchboard Age

Created by Mechanical and Electrical Reliability Team - March 2025

## SWITCHBOARD RENEWAL ASSESSMENT TOOL (FRONT END)

SWITCHBOARD	DATA - FROM RENEWAL ASSESSMENT TOOL TAB			
Switchboard Age	49	EXTREME	4	
Switchboard Condition	FAIR OR MODERATE	MEDIUM	2	
Arc Flash Rating (Line Side)	CAT 1M	LOW	1	
Arc Flash Rating (Load Side)	0			
Site Criticality	LOW	LOW	2	
Hazard (Controlled)	1	LOW	1	

	2.0	< Average calculated from Switchboard Data (E3)
	MONITOR	

Switchboard Age	49	EXTREME	4	
Switchboard Age	49	EXTREME	4	< Switchboards > 49yrs will override to REPLACEMENT
Condition	FAIR OR MODERATE	MEDIUM	2	
Condition	FAIR OR MODERATE	MEDIUM	2	< Switchboards > 49yrs in GOOD condition will override to BE
Switchboard Age	49	REPLACE		< Switchboards > 40yrs in FAIR OR MODERATE condition will
Switchboard Age	49	REPLACE		< Switchboards > 25yrs in POOR condition will override to BE
Switchboard Age	49	REPLACE		< Switchboards > 25yrs in VERY POOR condition will override t

Arc Flash Rating (Line Side)	CAT 1M	1		< Any Incident Energy greater than CAT 2 will override to INVE
Supply Authority Investigation (Load Side)	GOOD	MONITOR		< Switchboard that is in GOOD and FAIR OR MODERATE condition, greater than CAT 2 and > 25years will override to
Supply Authority Investigation (Load Side)	FAIR OR MODERATE	MONITOR		
Supply Authority Investigation (Load Side)	CAT 1M	1		INVESTIGATE

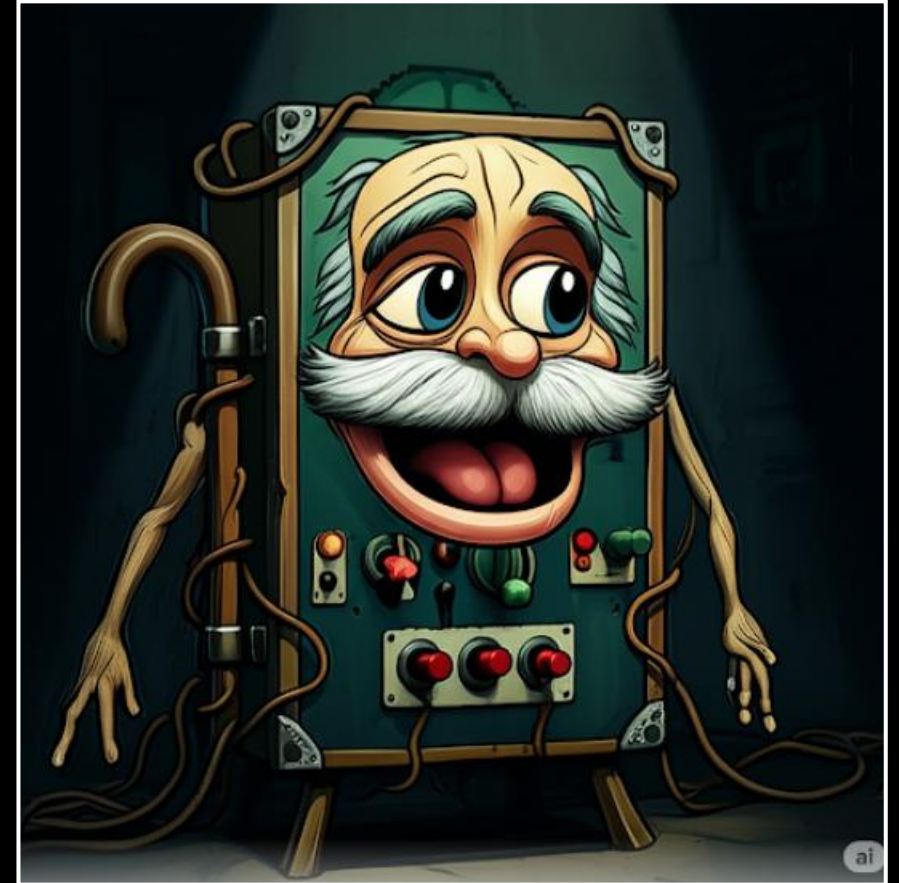
Supply Authority Investigation (Load Side)	POOR	MONITOR		< Switchboard that is in POOR and VERY POOR condition, greater than CAT 2 and > 20years will override to REPLACE
Supply Authority Investigation (Load Side)	VERY POOR	MONITOR		
Supply Authority Investigation (Load Side)	CAT 1M	1		
Supply Authority Investigation (Load Side)	49			

## SWITCHBOARD RENEWAL ASSESSMENT TOOL (BACK END)



# CHAPTER 5: COROLLARY

- Optimised capital renewal plan due to fewer switchboards replaced per year. This resulted in an improvement in the pricing submission.
- Gave YVW an advantage to build a case for the upliftment of the maintenance plan of the switchboards.
- Significant milestone in the journey to achieving the preventative: reactive maintenance budget ratio of 70:30.
- Maximum utilisation of the asset, whilst maintaining its safety and reliability.





QUESTIONS?