Satellite vegetation management

Innovation allowance findings report

September 2025

POWERCO

Satellite vegetation management: Innovation allowance findings report

Contents

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1. Introduction

1.1 Purpose of this report

This is Powerco Limited's ("**Powerco**", "**we**") close out report for the Innovation Project Allowance, for the satellite based intelligent vegetation management project.

This report is submitted to the Commerce Commission (**the Commission**) to meet the requirements of the DPP3 Determination Schedule 5.3 clause 5[1]. Clause 5(a) requires that, within 50 working days of completion of the innovation project, the EDB must 'submit a report to the Commission that outlines the key findings of that project'. Section 3 of this report outlines the key findings of the project. The report is also published on the Powerco website as required by clause 5(b).[2]

1.2 Powerco's innovation allowance application, approval and completion

Under the DPP3 Determination, Electricity Distribution Businesses (EDBs) may make an application to the Commission for approval of drawdown of the allowance under Schedule 5.3 of the Determination. An 'innovation project' is one which is focused on the creation, development, or application of a new or improved technology, process, or approach in respect of the provision of electricity lines services[3].

The Powerco application for the innovation allowance was submitted in two stages aligned to the two stages of the Satellite vegetation management project:

- Application for stage 1: Small trial in FY24
- Application for stage 2: Network capture, customisation and testing in FY25.

The Commission's approval was given for stage 1 and stage 2.

The 'completion' of stage 1 and 2 (for the purpose of Schedule 5.3 clause 5) was in July 2025 following completion of systems/ process integration, initial results from testing, data analysis and compilation of project results.

[1] The 2020 DPP Determination was updated to include Powerco's transition in November 2022: 5B20225D-NZCC-25-PowercoE28099s-transition-to-the-2020-2025-DPP-Final-determination-30-November-2022.pdf (comcom.govt.nz) The Commission also updated Schedule 5.3 in November 2023 to update clause 5.3(2)(c) relating to the specialist report: Electricity-Distribution-Services-Default-Price-Quality-Path-Innovation-Project-Allowance-Approval-Criteria-Amendment-Determination-2023.pdf.

[2] Electricity disclosures

[3] Input Methodologies Determination, Interpretation section 1.1.4: electricity-distribution-services-input-methodologies-determination-2012-consolidated-as-of-23-april-2024.pdf (comcom.govt.nz)

1.3 Sharing project learnings

This report contributes to Powerco sharing information about this project and our learnings for the benefit of other electricity distributors and the wider electricity sector. Activities we have, or will, undertake to share information include:

- Publishing the two applications
- Publishing this completion report
- Project update in the industry insights section of our website[4]
- Presenting on the project at an upcoming Electricity Networks Aotearoa Forum with an EDB audience[5]
- Briefings with individual EDBs with an interest in the application
- Seeking to present at the 2026 EEA conference.

2. Project outline

2.1 Project overview

Table 1 presents an overview of the project stages, cost and how the innovation allowance drawdown has contributed.

[4] Satellite vegetation management project overview on Powerco website
[5] To be confirmed, most likely for ENA Future Network Forum in late 2025

Table 1 Project overview

Project stages		Cost
Stage 1: The trial (complete)	The trial captured a representative sample of 14 feeders across the network at different points in their vegetation management cycle (e.g., recently cleared, mid-cycle, overdue) to allow for a robust assessment of vegetation conditions and how AI models perform across different scenarios, prioritisation, planning and budgets.	Capex: $0 Opex: $150,000 Allowance drawdown: $75,000
Stage 2: Network capture and calibration (in progress)	This stage focussed on the acquisition of satellite imagery capture across 748 feeders and setup of the initial AI-model to be utilised for planning and prioritisation. Through this stage, continual refinement of data-driven vegetation management is being undertaken. Business rules, customisations and scenario modelling is being explored to support planning and execution that enhances reliability, safety, and cost-effectiveness across the networks 748 feeders. Supporting this is the deployment of the field mobility solution to compliment the AI ecosystem.	Capex: $1,689,900 Opex: $0 Allowance drawdown: $375,906
Stage 3: Full system integration and strategy validation (Not started)	This stage would be the full integration into our core system (SAP), the first of the repeat annual captures and the phased transition into a condition-based vegetation management programme with integrated workflows.	TBC

2.2 Project description

Managing vegetation is a continual challenge and a leading contributor to reliability risk across our overhead network. Having access to accurate and timely information that can be converted to action quickly, can shift what is largely a reactive approach to a measured proactive strategy that can be pivoted as operational, or business constraints emerge.

Current methods of acquiring data are effective but remain resource intensive and costly, relying on methods that involve complexities around safety, forward planning and post processing – LiDAR and field inspections. Having a fully remote, easy to deploy solution opens opportunities to improve practices, streamline processes and leverage automation in new ways. The improvements in satellite technology and continual advancing of AI provide the opportunity to test an alternative to LiDAR to improve risk understanding, prioritise work, and increase reliability and safety.

The drivers leading to Powerco's investigation of this satellite vegetation management approach include:

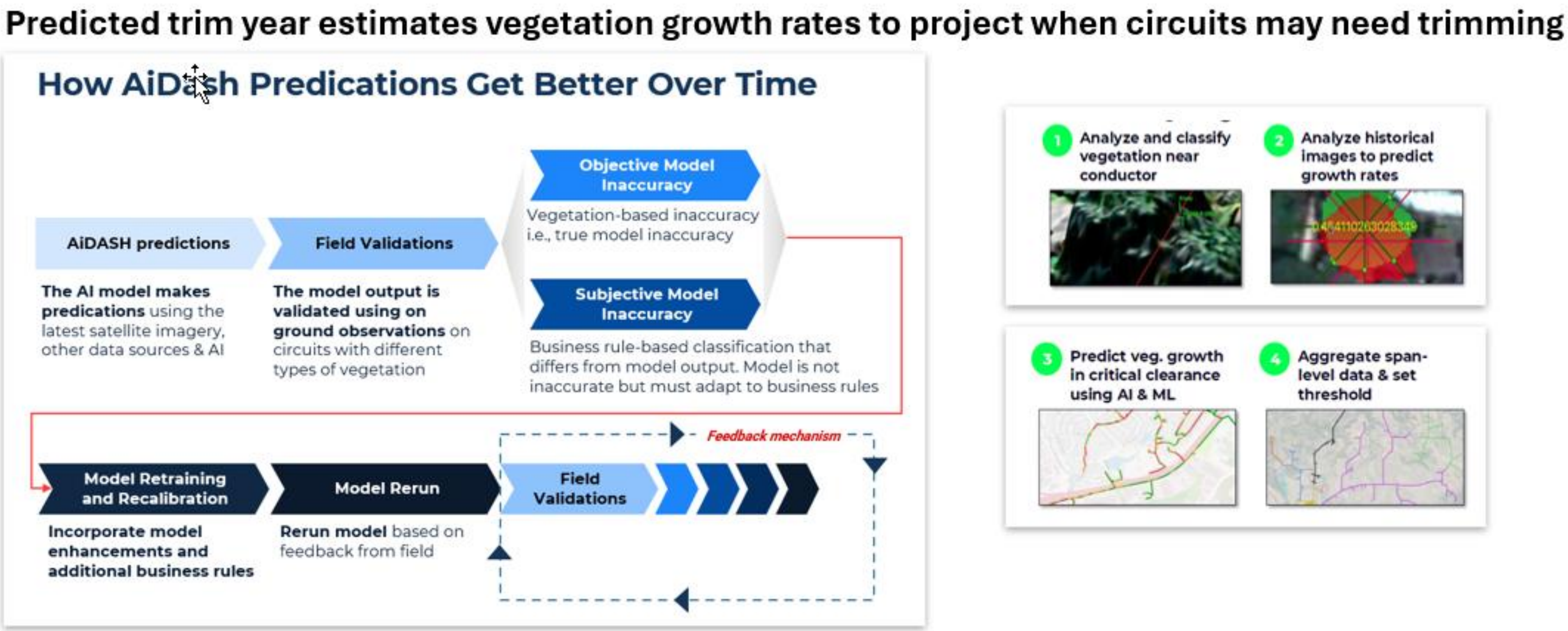
- Technology advancement in satellite imagery
- Predictive analytics and artificial intelligence
- Operational efficiency and optimisation
- Risk-based prioritisation
- Improved long term forecasting

Powerco partnered with AiDASH for this project to test a new approach using high-resolution satellite imagery and AI models to:

1. Classify vegetation and clearance zones
2. Predict growth rates using historical imagery
3. Identify poor health hazard trees
4. Identify and prioritise segments for trimming based on risk and network criticality
5. Automate the planning and prioritisation process
6. Prepare long terms scenarios to model impact of business constraints on a chosen strategy
7. Optimise spend and quantify impact
8. Explore the ability to remotely audit work undertaken

An overview of the AiDASH approach to trim year predictions is illustrated in Figure 1 along with an illustration of how the predictions of risk and priorities will improve over time.

Figure **1**: Overview of AiDASH process for improving prediction accuracy over time and natural trim year predictions



2.3 Project delivery

The project trials and testing progressed in FY25 as anticipated in our June 2024 application (link in Section 1.2 above).

As a result of the findings across stage 1 and 2, Powerco has now committed to implementing the project for five years starting in FY26. This will involve annual data captures for those five years. These future years for the project will involve ongoing optimisation activities and costs for system integration, operational processes adjustments, training and support.

We are currently working through calibration activities and integrating supplementary data into the platform to support more accurate cost predictions, work type requirements and standard reporting for internal and regulatory purposes. Over the period September 2025 to November 2025 we will be working closely with our vegetation contractors to refine the field mobility application which will be a key data source to improve analytics. In FY26 we will also configure an additional module for storm response. Other modules may be considered over the subsequent 5 years. A full review will be completed after 5 years of operation.

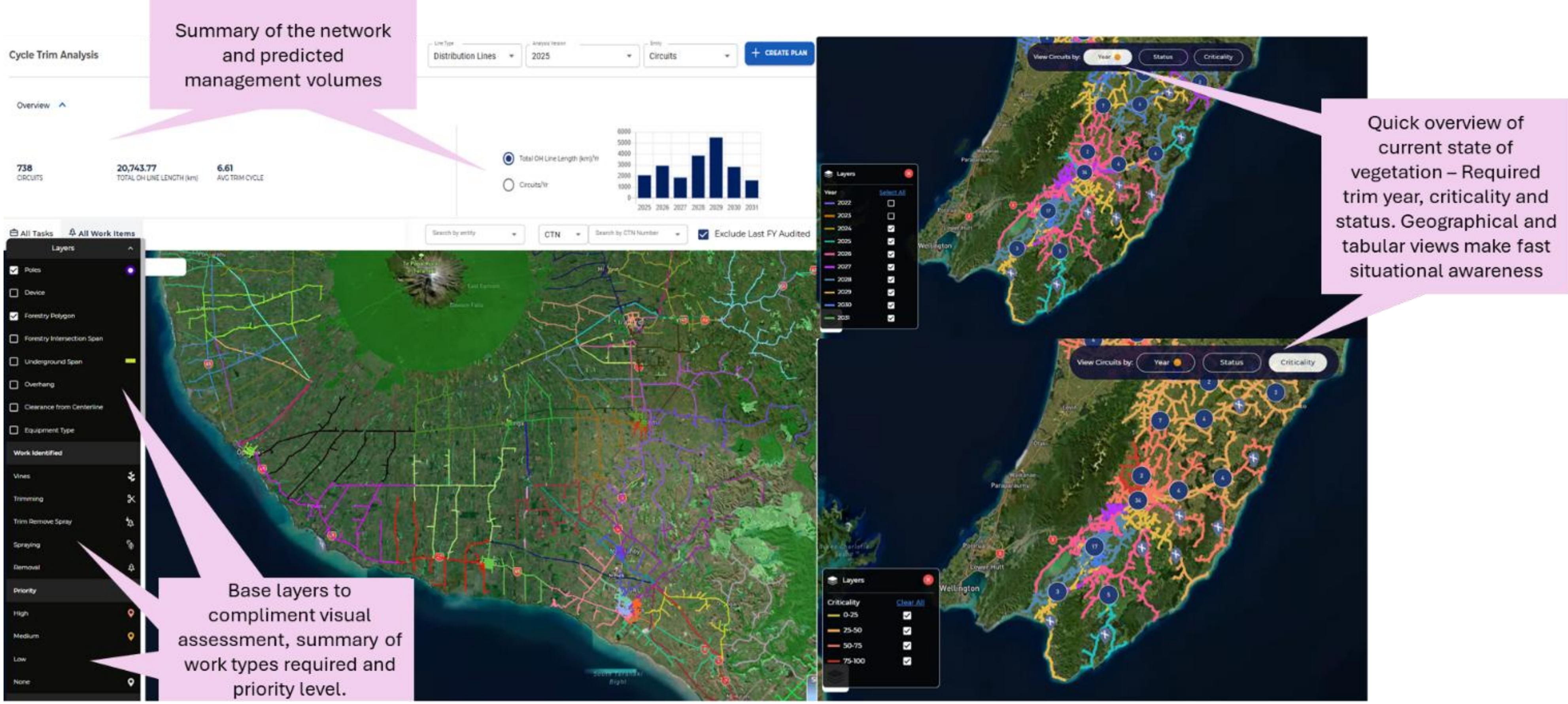
While Powerco now plans to roll out the technology starting in FY26, the point of project 'completion' for the purposes of Schedule 5.3 (5) is determined to be following stage 2 data analysis, August 2025, when we are in a position to report on the project findings and share these with the sector.

3. Project findings

3.1 Insights from first capture

The initial data capture was conducted to establish an understanding of the current vegetation state across our network and what 'ideal' management cycles would be to allow us to develop a transition strategy from how we currently manage vegetation. These ideal cycles are built on criticality and growth rate triggers and can be interrogated from a feeder level or by segment or protection zone. This effort supports the development of a risk-weighted vegetation management plan and enables the optimisation of resources to address vegetation-related risks effectively. The feeder level layers of information and summary at broader network level are illustrated in Figure 2: visual representation of the current state and predicted intervention required at feeder level..

Figure **2**: visual representation of the current state and predicted intervention required at feeder level.



The configuration of the supporting business rules provides a structured approach to managing feeders in alignment with operational priorities and compliance requirements. These are fully customisable to how the business operates or manages risk and can include supplementary data layers to inform decision making. Once established the impacts and effects of changes can be easily compared through the planning and prioritisation modules (section 3.2).

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Examples of criteria we applied to the baseline include:

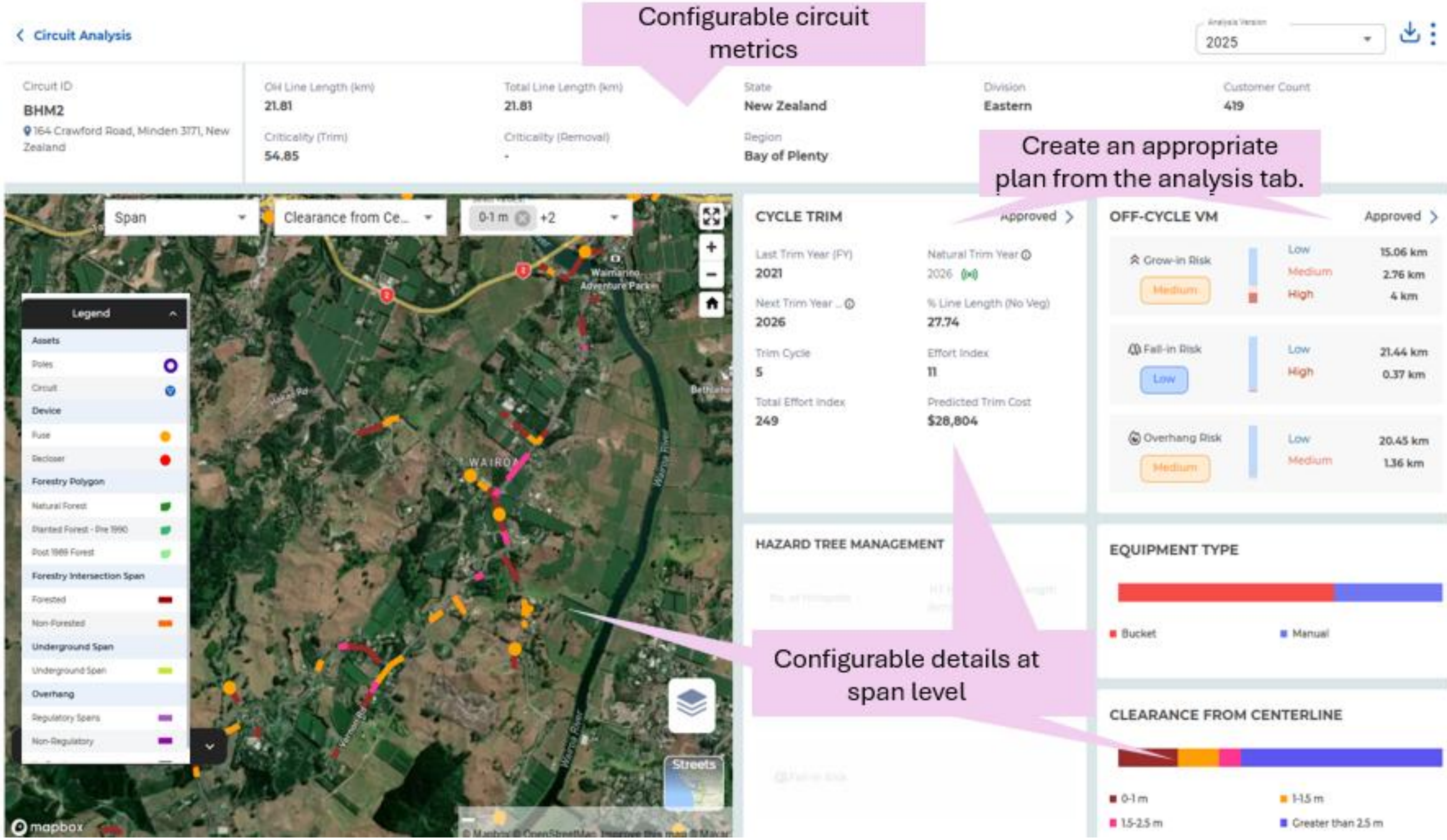
- The regulatory based cutback triggers
- Maximum allowable intervals between inspections
- Pass through commercial forestry
- Overhang remediation
- Voltage specific consideration.

Using this information a richness of data is immediately available for interrogation as seen in Figure 3 and Figure 5.

Figure **3**: Example of circuit analysis available which includes cost to manage, vegetation free length, tree health and criticality. Additional information not shown, % of feeder with no vegetation, utility set trim year and feeder data (length, spans, % commercial forestry)

Circuit ID	Circuit Name	Region	Voltage (kV)	Predicted Trim Cycle	Clearance from Centerline	Equipment Type	Last Trim Year	Natural Trim Year	Predicted Trim Cost
PUT1	HORAHORA	Valley	11.000	8			2021	2029	$44,864
BHM2	WAIROA	Bay of Plenty	11.000	5			2021	2026	$28,804
TAS7	OAONUI	Taranaki	11.000	8			2021	2029	$27,012
BKL15	BROOKLANDS 15	Taranaki	11.000	6			2024	2030	$2,411
CIT10	CITY 10	Taranaki	11.000	8			2022	2030	$6,337
BKL13	BROOKLANDS 13	Taranaki	11.000	6			2022	2028	$6,955
OMO1	TE PUNA	Bay of Plenty	11.000	1			2024	2025	$29,068
PKO8	DU PONT	Valley	11.000	8			2021	2029	$1,784
NGA3	SOUTH RD NGARIKI	Taranaki	11.000	8			2021	2029	$25,205

Figure 4: Customisable circuit analysis insights



3.2 Planning and prioritisation capability

An area where significant value is potentially attainable is turning the insights into operational plans that balances regulations, performance and risk. This is informed by data on fault history, growth rates, effort and criticality coupled with external constraints. We are developing the appropriate output format that will complement our supporting business processes by allowing comparative prioritisation against network investment opportunities through Copperleaf to support vegetation management alternatives or data driven justification of additional operating expenditure.

The planning methodology prioritises activities in three scenarios as follows:

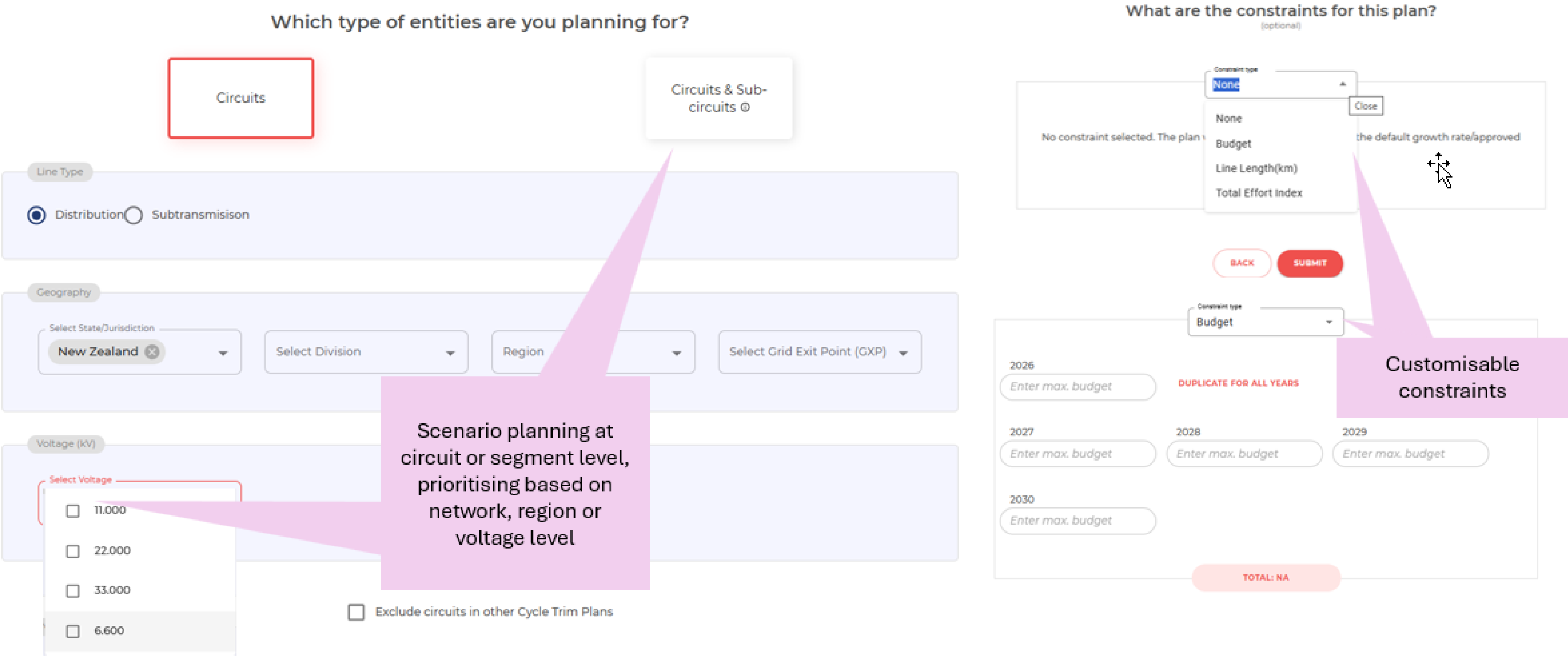
1. Condition based cyclical plans
    - Prioritisation over the network as a whole
    - Regional prioritisation
    - Voltage or criticality prioritisation
2. Scenario specific plans for risk mitigation
    - Regulatory changes – addressing overhang
    - Commercial forestry
    - Fall in
3. Hot spotting
    - Defect management
    - Hazard tree management

Powerco will create a rolling 5-year plan comprising of each of these scenarios. This will provide better certainty for our whole of works programme and contractors to resource appropriately over any particular contract period.

Figure **5** to Figure 7 show an example of stepping through these scenarios and planning on our network.

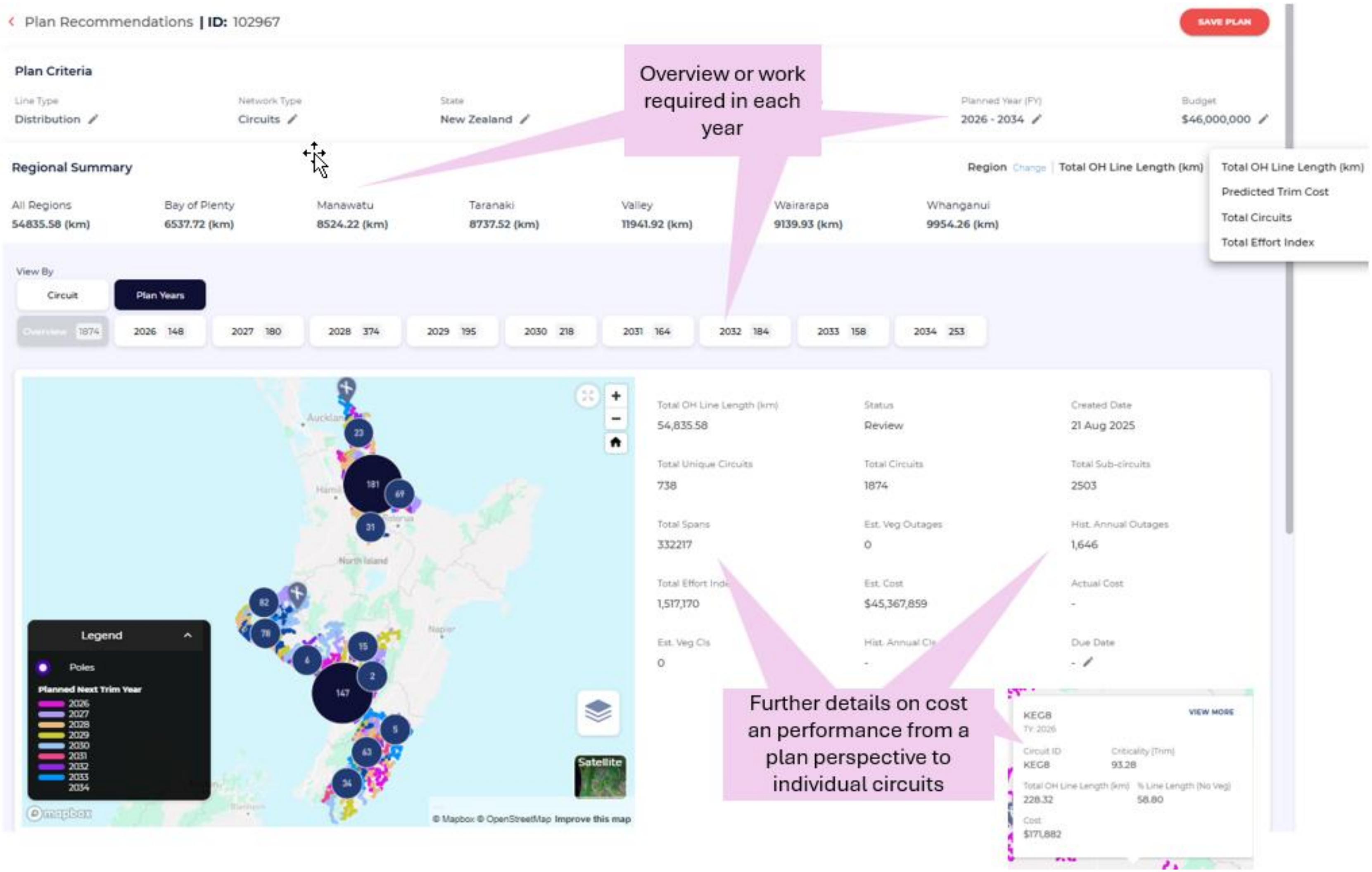
Budget is one of the constraint scenarios that can be applied (as shown in Figure 5) at network level, region level, GXP level and the tool then prioritises how best to utilise that budget.

Figure **5**: Setting up a modelling scenario and applying customisable constraints, budget, line length etc.



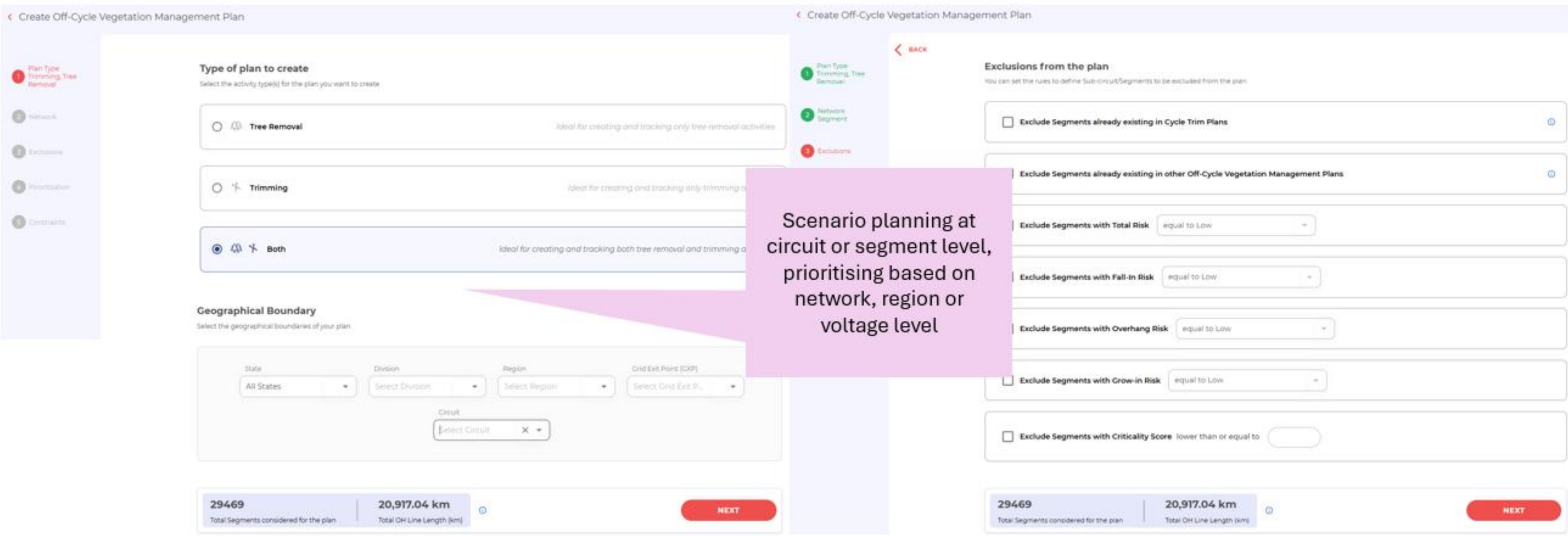
Once created, an overview of the cyclical plans are quickly accessible and variable scenarios are easily comparable. As more supplementary information is integrated into the system, predictions develop and become more representative of the situation on the ground, such as customer interruptions, expected costs based on effort index, historic work and methodology type.

Figure **6**: Cyclical plan summary view



With cyclical plans set for an arbitrary period, detailed risk plans can be established. The application considers existing plans and constraints and assists in prioritising risk work based on risk and violation type. Constraint and prioritisation criteria can be selected and applied at full network level, area or feeder level.

Figure **7** Risk plans



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Segments

Search By Entity ID

Segment ID	Total Risk	Grid Exit Point (GXP)	Total OH Line Length(km)	Criticality (Trim)	Avg. Downstream Customers	Grow-in Risk	Fall-in Risk	Overhang Risk	Actions
TGA11-R077_nf	High	TAURANGA 11	0.50	99.99	1,197	High	Low	Medium	
ATU2-R080_f	High	TE MATAI	0.60	99.57	669	High	Low	High	
TGA11-R027_f	High	TAURANGA 11	1.09	99.31	1,299	High	Low	Medium	
FEI21-R02_nf	Medium	BUNNYTHORPE	0.85	97.14	2,222	High	Low	Medium	
WGM3-R021_f	Medium	WAIKINO	0.68	95.32	1,220	High	Low	High	
MABCB94-R093_	High	GREYTOWN	0.86	94.42	761	High	Low	Medium	

The ability to analyse, interpret and turn the data into actionable plans is extremely efficient compared to the previous approach. We are still working through field data capture, data needs and user experience, which is a fine balance, but a key consideration for the success of the AI ecosystem.

3.3 Image capture and satellite constellation location

Currently image captures are possible one to two times per day providing few opportunities to capture high quality imagery at the appropriate time of day and under suitable weather conditions. The full network imagery capture was more challenging than anticipated with the configuration of the available satellite constellations and weather being contributing factors.

Capture needs to be undertaken in growing season to have the best accuracy which can impact delivery timelines when targeting a vegetation management programme that starts at the beginning of the financial year.

Some limitations we found in image capture were:

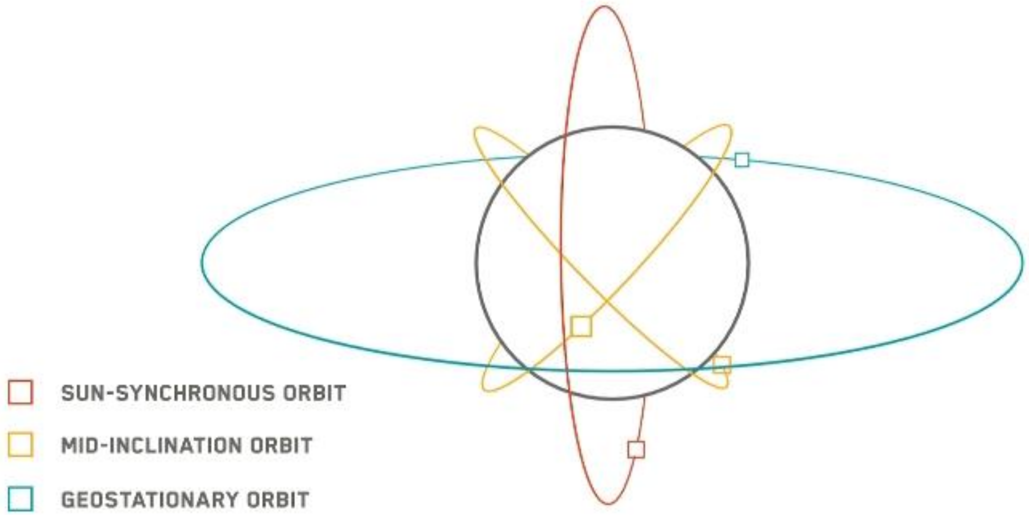
- The image capture took longer than planned with significant weather delays – mostly in east with persistent cloud cover even through summer season.
- There is limited availability of satellites in correct position for New Zealand capture this financial year and next financial year. It is not clear that increased availability of satellites would reduce future capture time or if weather conditions will remain a challenge.
- The ability to have multiple captures of network in one year could be more limited than initially conveyed with the current satellite availability. As a result, applications in post storm or other situational awareness scenarios would be challenging. For vegetation management annual captures are beneficial at the start of the programme to improve area specific predictions.

With the constellation location, predominantly sub-synchronous constellations are available, and while ideal for consistent lighting conditions and global coverage, especially useful for polar and high-latitude regions opportunity for capture across New Zealand is limited with up to two passes per day.

Maxar, currently the main supplier of imagery to AiDASH, is launching the WorldView Legion [6]constellation consisting of multiple mid-inclination orbit (MIO) satellites in the second half of 2025 (as illustrated in Figure **8**. These satellites are optimised for high frequency revisits over mid latitude regions, resulting in up to 15 captures possible per day over New Zealand. This will facilitate faster turnaround for tasking and delivery of imagery.

[6] https://www.maxar.com/worldview-legion, last accessed 25 August 2025

Figure **8**: A sun-synchronous orbit takes a satellite around the poles of the Earth while a mid-inclination orbit takes a satellite around the middle section of the Earth. The geostationary orbit causes a satellite to rotate at the same pace as Earth.



3.4 System integration

The existing field application of the product has been developed for a different workflow. Elements explored during the trial functioned as expected, then as the project progressed, we evolved our requirements with more complex customisations.

As we gained more insights and evolved the elements of the project, this created more complex developments in the IVMS platform to integrate with our core SAP system. This integration is critical to ensure an end-to-end solution is maintained and configured for the New Zealand context. For example, ensuring the data aligns to issuing and tracking Customer Trim Notices (CTN) whilst also meeting Powerco reporting requirements.

3.5 Next steps in development and implementation

Establishment and configuration of the system has experienced delays. This was predominantly due to the challenges with imagery acquisition as previously outlined. Despite these delays, we now have access to the full network data and have begun generating initial insights via the IVMS platform.

As we transition into the next phase of the project, our focus is on:

- Calibration of results to ensure accuracy and reliability
- Deployment of the supporting mobile field application
- Development of embedded reporting to meet regulatory, operational, and reliability requirements.

These activities will enhance our ability to plan and execute vegetation management strategies effectively.

To further support risk-based prioritisation, an additional module, the tree health module, will be tested and implemented. This module will enable remote identification of trees in poor health to compliment field identification and facilitate the creation of an inventory of high-risk vegetation. These insights could then be incorporated to complement the existing prioritisation frameworks and improve decision-making.

As planning and scenario development progresses, the outputs generated will be incorporated into our investment optimisation process, which is managed through Copperleaf. This integration will ensure that vegetation management decisions are aligned with broader financial and strategic objectives.

The current state of the platform allows us to easily model various scenarios by applying business constraints. We are developing the insights and scenario comparison tool, Figure 9, to improve usability and access to insights. In September 2025 we will be working with our contractors to fine tune the workflows and user interfaces prior to integration with our core SAP system. Following that we will be developing our forward 5-year plans to meet our regulatory, financial and reliability objectives.

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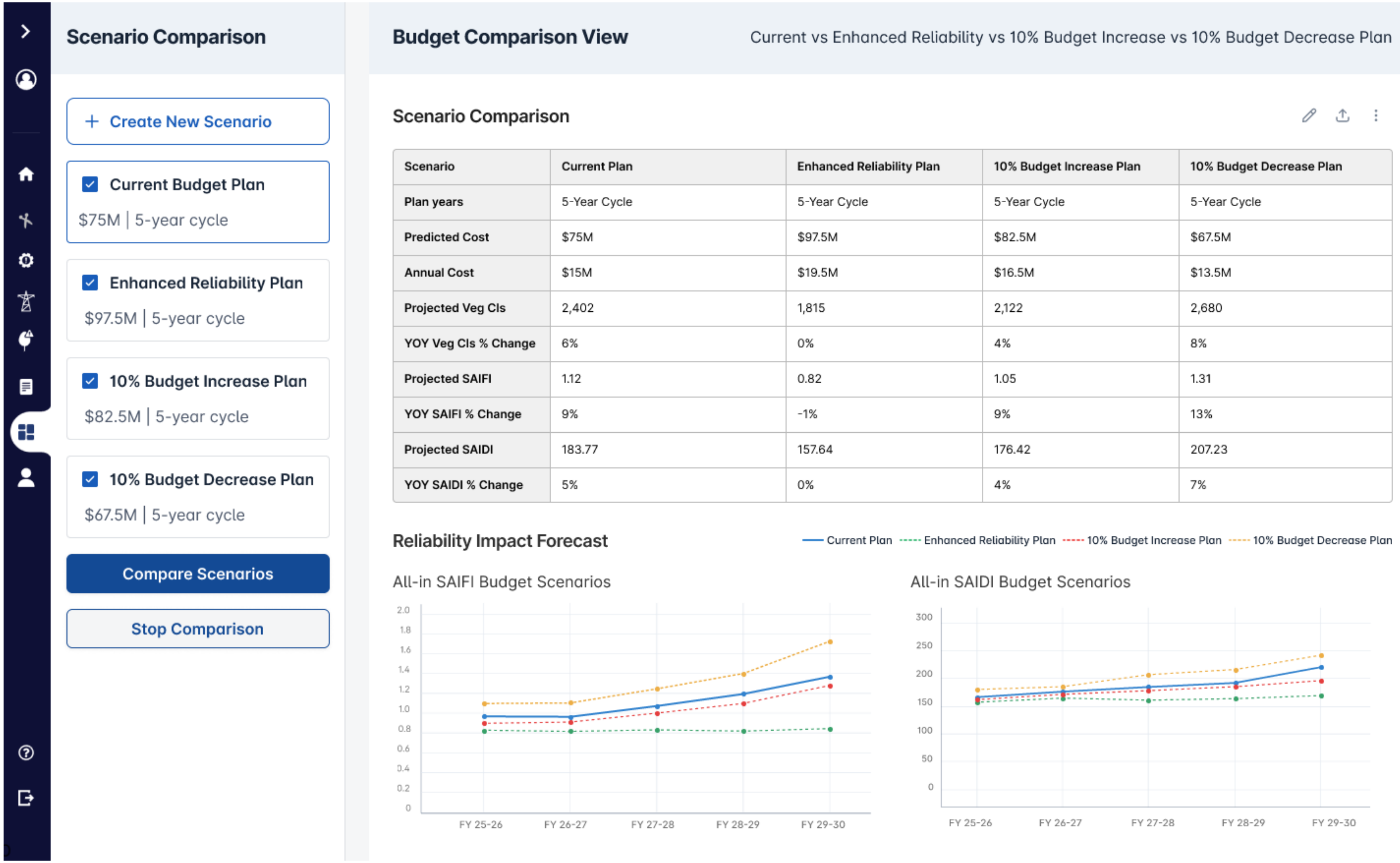
Figure **9**: Example of scenario comparison interface under development.



Scenario	Current Plan	Enhanced Reliability Plan	10% Budget Increase Plan	10% Budget Decrease Plan
Plan years	5-Year Cycle	5-Year Cycle	5-Year Cycle	5-Year Cycle
Predicted Cost	$75M	$97.5M	$82.5M	$67.5M
Annual Cost	$15M	$19.5M	$16.5M	$13.5M
Projected Veg CIs	2,402	1,815	2,122	2,680
YOY Veg CIs % Change	6%	0%	4%	8%
Projected SAIFI	1.12	0.82	1.05	1.31
YOY SAIFI % Change	9%	-1%	9%	13%
Projected SAIDI	183.77	157.64	176.42	207.23
YOY SAIDI % Change	5%	0%	4%	7%

Following the second capture, weather information will be integrated into the AI ecosystem to support the implementation of the Climate Risk Intelligence System (CRIS). This tool combines detailed vegetation information with real-time weather to inform us where to pre-position storm restoration resources to reduce customer SAIDI/SAIFI as well as highlight network weaknesses for weather patterns. Figure 10 shows an example of how other utilities have leveraged the climate information.

Figure **10**: Example of the CRIS module interface utilised by an American utility.

4. Conclusion

This project marks a significant step forward in transforming Powerco's vegetation management from a reactive to a proactive, data-driven approach. By leveraging high-resolution satellite imagery and AI, the initiative enables repeatable streamlined risk assessment, prioritisation, and planning. The initial results show strong potential to improve reliability, safety, and operational efficiency while reducing reliance on costly, resource-intensive methods.

With a five-year implementation plan beginning in FY26, Powerco is committed to annual data captures, system integration, and continuous improvement. As the platform matures, it will enable the creation of rolling five-year plans that balance risk, performance, and cost to deliver greater certainty and value across the Powerco network with subsequent customer benefit.

POWERCO