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Directlink

Stakeholder Meeting 2: Capital expenditure

11 October 2023



I'd like to begin by acknowledging the Traditional Owners of the land on which we all meet from today and pay my respects to Elders past, present and emerging.

Welcome and purpose

Objective: To set the scene for the meeting.

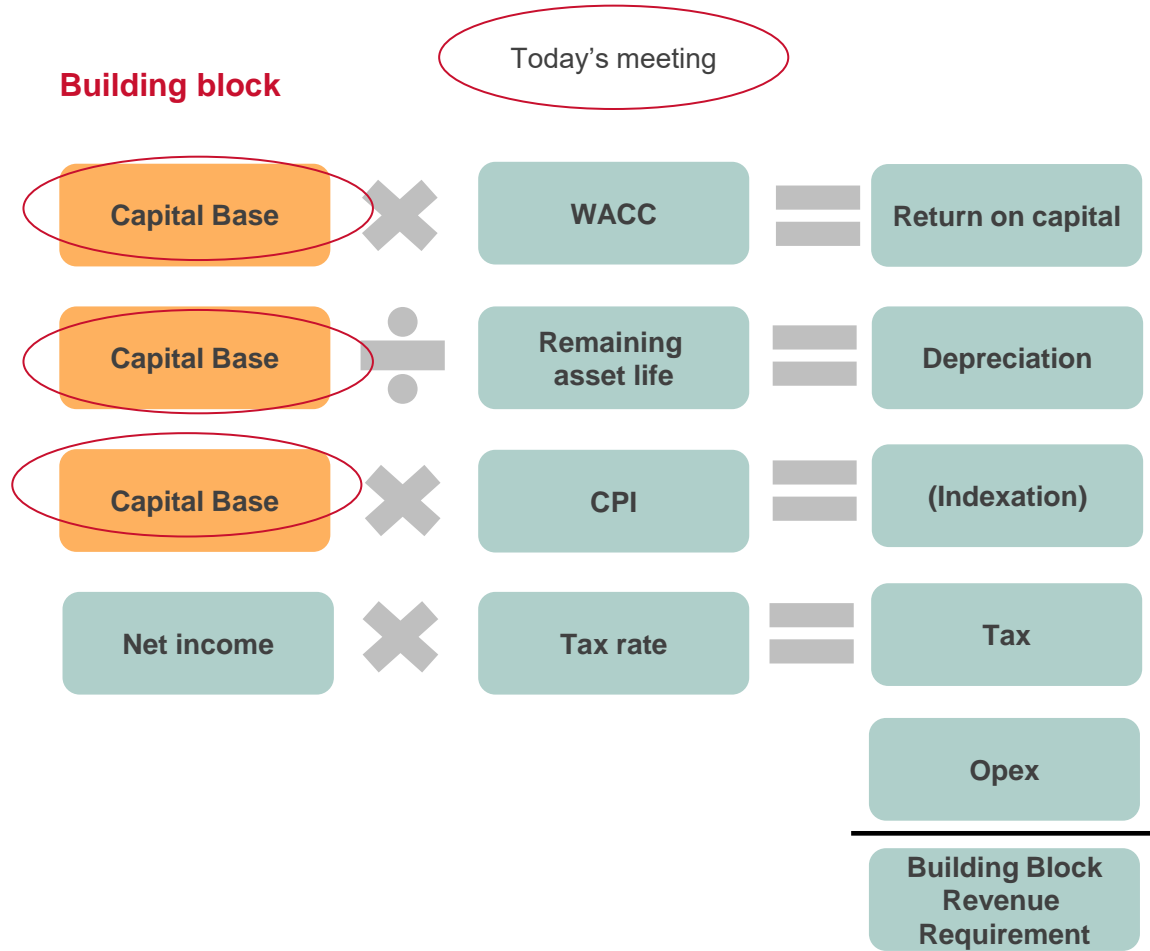
Agenda for today's meeting

Activity	Lead	Time
Welcome and purpose	Beth Griggs, General Manager Regulation and External Policy APA Group	1:30pm – 1:35pm
Context for Directlink’s Capital Expenditure	Mark Allen, Regulatory Manager, Economic Regulation and Policy APA Group	1.35pm – 1.55pm
Capital expenditure options for the 2025 to 2030 period	Annie Martyn, Asset Manager, APA Group	1.55pm – 2.55pm
Wrap up and thanks	Mark Allen, Regulatory Manager, Economic Regulation and Policy APA Group	2.55pm – 3.00pm

Context for Directlink's capital expenditure

Objective: To ensure all stakeholders have a common understanding of the background and context for decisions around Directlink's capital expenditure

Understanding the regulatory building blocks



How capital expenditure affects revenue?

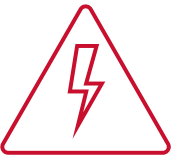
- Capital expenditure is money used to purchase, upgrade or extend the life of an asset
- They are long term investments meaning:
 - they have a life of more than one year; and
 - are paid for by customers over the life of an asset
- Capital expenditure is added to the existing capital base - otherwise known as the Regulated Asset Base (RAB)
- The RAB affects:
 - the return on capital
 - depreciation
 - indexation

Context for Directlink's capital expenditure



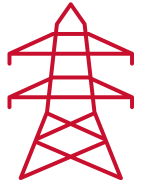
December 2000

Directlink was commissioned using leading edge technology for the time. Due to reach end of economic life in 2042.



180MW

Delivery capacity to both NSW and QLD



63 km

of transmission lines consisting of 3 parallel high voltage direct current transmission lines



2

Converter stations at Bungalora and Mullumbimby



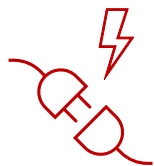
1,800mm

Average annual rainfall in the Mullumbimby area



Difficult terrain

Easements run through steep terrain and across different land uses



Reliability

Has been poor due to legacy construction issues and operating environment.

Emerging and future challenges identified at the Directlink co-creation workshop



Affordability



Energy transition



Climate change, environment and resilience



Vulnerability to supply chain issues



Labour and skills shortages



Future demand for Directlink



Technology advancements



Managing risks



Planning for end of life

AEMO engagement

Outage management

- AEMO and the market need as much notice as possible for scheduled outages
- Longer outages can be problematic if there are other problems in the NEM – needs more discussion and agreement
- AEMO is expecting more unpredictability and uncertainty is growing
- Shorter recall times are preferred

Impact on NSW

- Directlink is a critical asset particularly for the Lismore and Armidale regions
- Significant voltage problems can occur if all 3 Directlink cables are out
- This is especially true in periods of high demand

Impact on QLD

- Directlink is more useful for NSW, especially for voltage control
- However, during shoulder seasons, voltage support in QLD is becoming more important

Future demand for Directlink

- New England Renewable Energy Zone (REZ) may be an important consideration for Directlink's end of life
- APA is planning to meet with AEMOs ISP team to discuss further

Black start

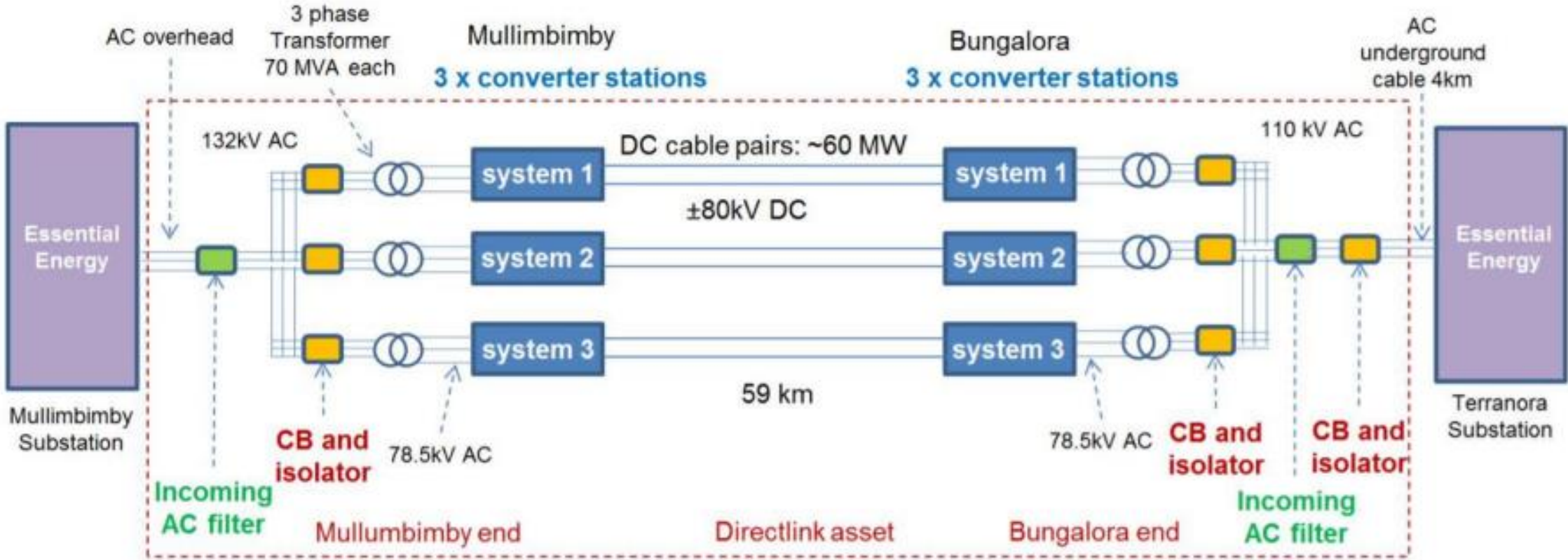
- AEMO don't foresee a requirement for Directlink to act as a black start support service during the 2025-30 regulatory period (at least in the early stages of that period)

Other observations

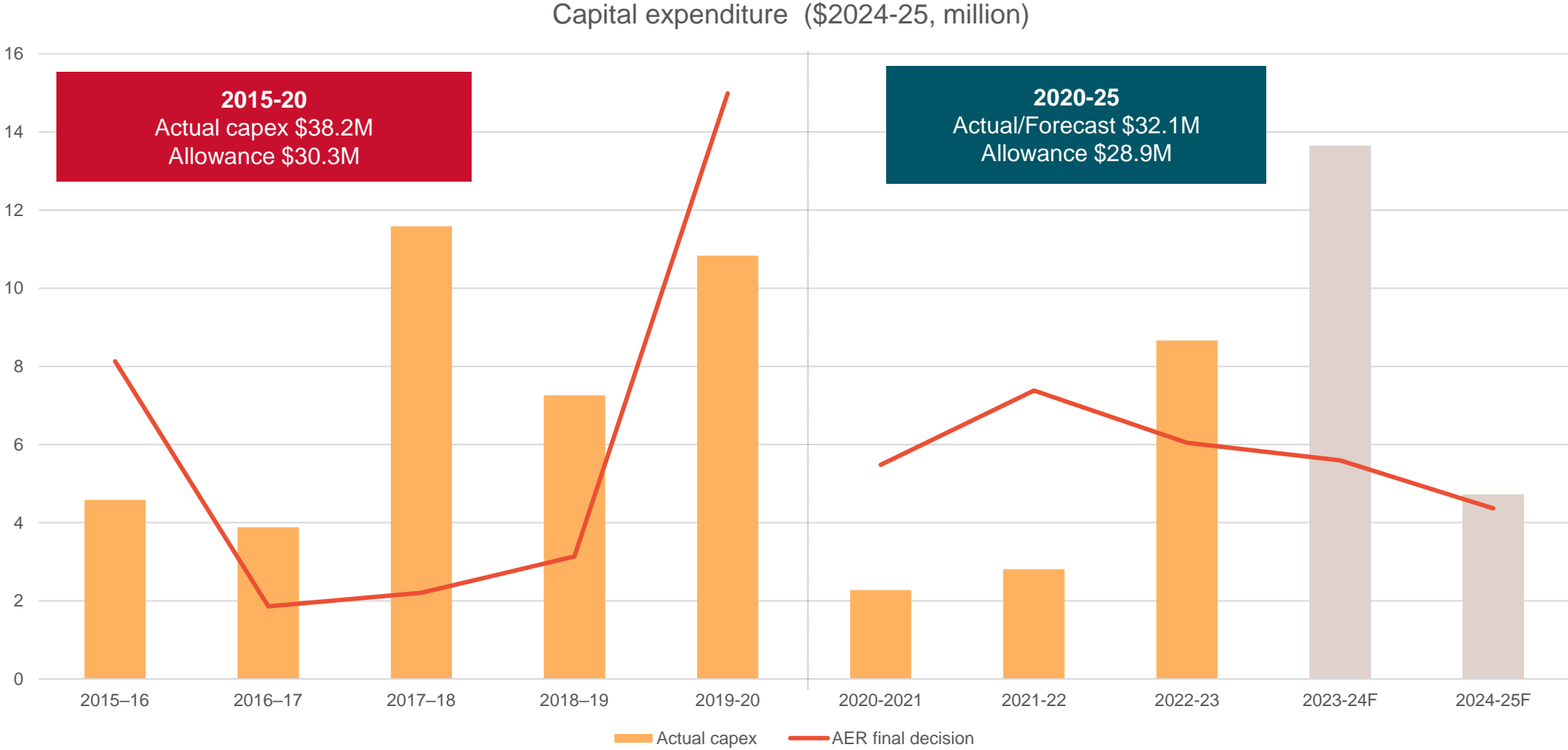
- AEMO is starting to notice network operators and generators are finding it harder to source replacement parts, particularly for ageing assets
- Resources and skilled labor are becoming increasingly difficult to find

APA met with AEMO on 11 September (Outage duration and planning) and 13 September (Black start support). A further meeting is planned to discuss how Directlink may interact with the New England Renewable Energy Zone.

Directlink's hardware



Directlink's previous capital expenditure



1. 2023-25 and 2024-25 forecast capital expenditure is assumed to be equal to the allowance

Key projects over 2020 to 2025 (incl IGBTs)

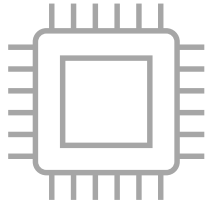
Timing	Forecasted project overview	Cost	Reason for capex/benefit
2021	Replacing failing fibre optic cables	\$960k	Failure of the optic fibres results in failures of other more significant equipment or catastrophic failures of multiple pieces of equipment.
2021/22	Industrial control system upgrade	\$5.7m	Upgrade of Bungalora System 1 valve room from Gen 1 to Gen 3 IGBTs with the recovered Gen 1 IGBTs used as spares for the remaining System 2 & 3 valve rooms.
2021-25	Stay in Business (refurbishments)	\$2.6m	Refurbishment of cooling pumps, fans, dampers, actuators and exhaust fans. Cable Protection, Phase Reactor Cooling, Power Supply Upgrades, Cable Faults, Testing Equipment
2023/24	Essential Spares	\$2.6m	Spare Cables, capacitors, PLC Reactor Filters and Transistors
2022-25	RIT-T - The obsolescence of generation 1 IGBTs	\$25.5m	Long term Capex Replacement Contract between ABB & APA to maintain a level of spare IGBTs.

* RIT-T approved FY22

Capital expenditure options for the 2025 to 2030 period

Objective: To seek stakeholder views on capital expenditure options for the 2025 to 2030 regulatory period

Capital expenditure overview 2025 - 30



1. Safety and protection

~\$83k
to
\$2.1M

2. Asset monitoring

~\$0
to
\$1.3M

3. Major maintenance

~\$2.3M

4. Spares management

~\$3.3M
to
\$10.2M

5. Insulated-gate bipolar transistors (IGBTs)

\$5.6M

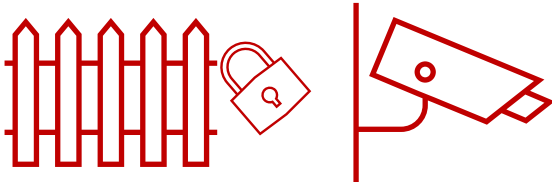
Outcomes of RIT-T

Decision range is \$11.3M to \$21.5M

1: Safety and protection




Site security improvement




Why do we need to invest?

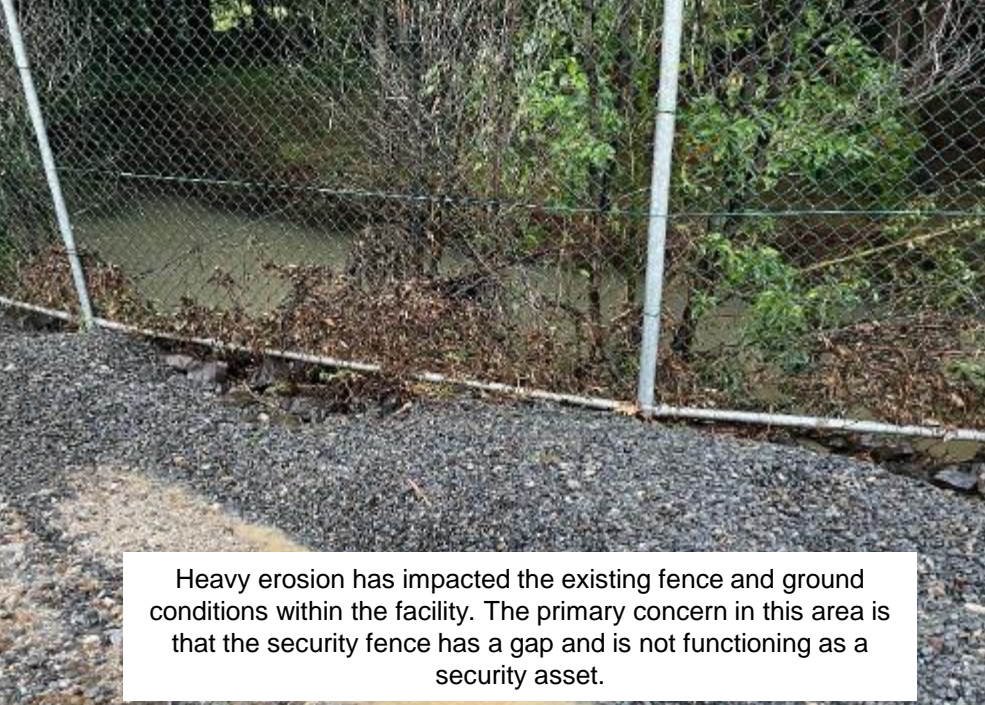
- Ongoing risk of break ins, loss of spares/cable etc. major asset damage, resulting in extended outage
- Break ins have occurred at a number of electrical transmission and generation sites within APA and across Australia. These have been increasing in frequency in recent years.

	Option 1: Increase security rounds	 Option 2: Implement site security improvement project (preferred option)
What does it involve?	<ul style="list-style-type: none"> • Double the number of security rounds 	<ul style="list-style-type: none"> • Improve fencing to deter break-ins • Improve 24/7 site monitoring through CCTV • Security on call and reduced frequency rounds
Pros	<ul style="list-style-type: none"> • No additional capex for the 2025-30 regulatory period • Slight improvement in site security 	<ul style="list-style-type: none"> • Reduced risk of break ins, asset damage and loss of parts • Reduced risk of outages due to major asset damage • Improved public safety • Improved compliance with critical infrastructure asset requirements • Slight reduction in opex for the 2025-2030 regulatory period
Cons	<ul style="list-style-type: none"> • Ongoing risk of break ins, loss of spares/cable etc. • In the event of major asset damage, outages may be lengthy • Higher opex for the 2025-2030 regulatory period 	<ul style="list-style-type: none"> • Higher capex for the 2025-2030 regulatory period
2025-30 Capex	<ul style="list-style-type: none"> • \$0 	<ul style="list-style-type: none"> • \$1.5M
2025-30 Opex	<ul style="list-style-type: none"> • ~\$100k p.a. increase 	<ul style="list-style-type: none"> • ~\$50k p.a. decrease

Landslip risk management

Why do we need to invest?	<ul style="list-style-type: none"> • Degradation of land due to high rainfall • June 2023 site inspection of 6 flood affected areas observed erosion and landslips
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	Option 1: Temporary solution	 Option 2: Solution to end of asset life (preferred option)
What does it involve?	<ul style="list-style-type: none"> • Temporary props for currently degraded land slips • Monitor cable path and install temporary solutions on 'just in time' basis 	<ul style="list-style-type: none"> • Install increasingly robust support system in high-risk areas
Pros	<ul style="list-style-type: none"> • Less capex for the 2025-30 regulatory period 	<ul style="list-style-type: none"> • Reduced risk of land slip, cable support of collapse and cable fault • Reduced risk of extended outages
Cons	<ul style="list-style-type: none"> • Land slip risk due to sudden flood remains, which could result in cable support collapse and cable failure • Risk of extended outage to repair all cables and reinstate path remains 	<ul style="list-style-type: none"> • Higher capex for the 2025-2030 regulatory period
2025-30 Capex	<ul style="list-style-type: none"> • \$83K 	<ul style="list-style-type: none"> • \$0.6M
2025-30 Opex	<ul style="list-style-type: none"> • \$0 	<ul style="list-style-type: none"> • \$0



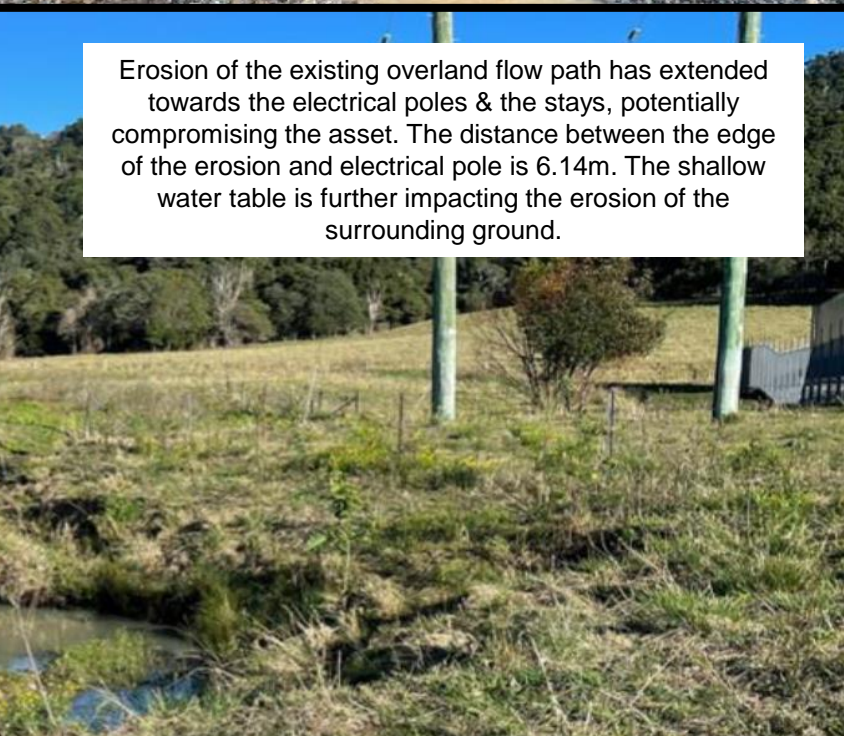
Heavy erosion has impacted the existing fence and ground conditions within the facility. The primary concern in this area is that the security fence has a gap and is not functioning as a security asset.



Land slip has caused material to be pushed up against the asset



Erosion has continued impact the creek bank and has now undermined the asset



Erosion of the existing overland flow path has extended towards the electrical poles & the stays, potentially compromising the asset. The distance between the edge of the erosion and electrical pole is 6.14m. The shallow water table is further impacting the erosion of the surrounding ground.

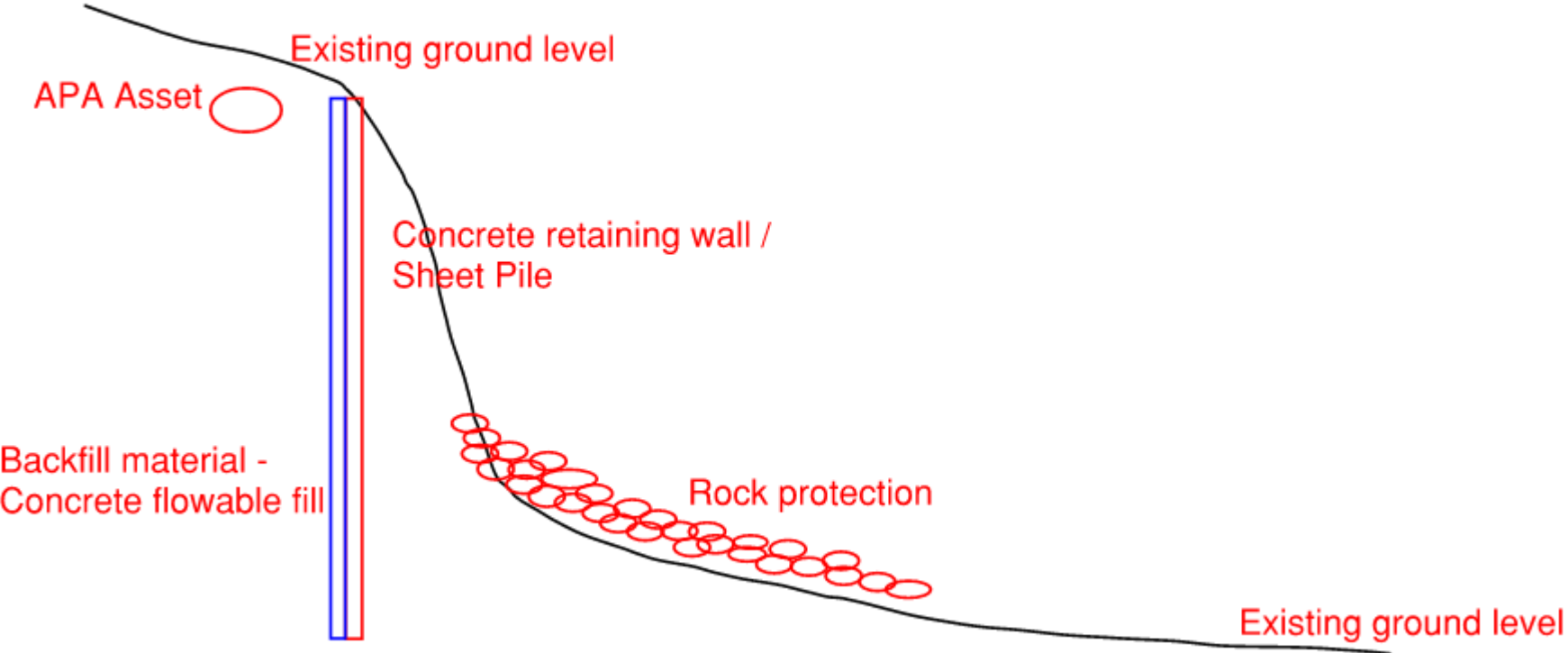


Erosion of bank below asset. Erosion is getting worse based on historical evidence.



Erosion of the creek bank has extended beyond the property boundary and within 300-600mm of the asset.

Landslip management – Option 2: Proposed support system




2: Asset Monitoring



Master Controller

Why do we need to invest? The manufacturer has recommended an upgrade to the master controller for Directlink for improved monitoring and reliability performance. The reliability improvement has not been able to be quantified by the manufacturer.

	 Option 1: Maintain current control systems	Option 2: Control system upgrade to Master Controller
What does it involve?	<ul style="list-style-type: none"> Do nothing more 	<ul style="list-style-type: none"> Install a master controller in FY28
Pros	<ul style="list-style-type: none"> No additional capex for the 2025-30 regulatory period 	<ul style="list-style-type: none"> Improves voltage control functionality and hardware reliability
Cons	<ul style="list-style-type: none"> Risk of declining reliability Unlikely to assist AEMO in black start support 	<ul style="list-style-type: none"> Higher capex for the 2025-30 regulatory period
2025-30 Capex	<ul style="list-style-type: none"> \$0 	<ul style="list-style-type: none"> \$1.3M
2025-30 Opex	<ul style="list-style-type: none"> No change 	<ul style="list-style-type: none"> No change

3: Major maintenance



Major Maintenance

Why do we need to invest?

- A number of assets are nearing end of life, for example, circuit breakers, corroded components of the physical structure etc.
- These are required projects for safety and compliance

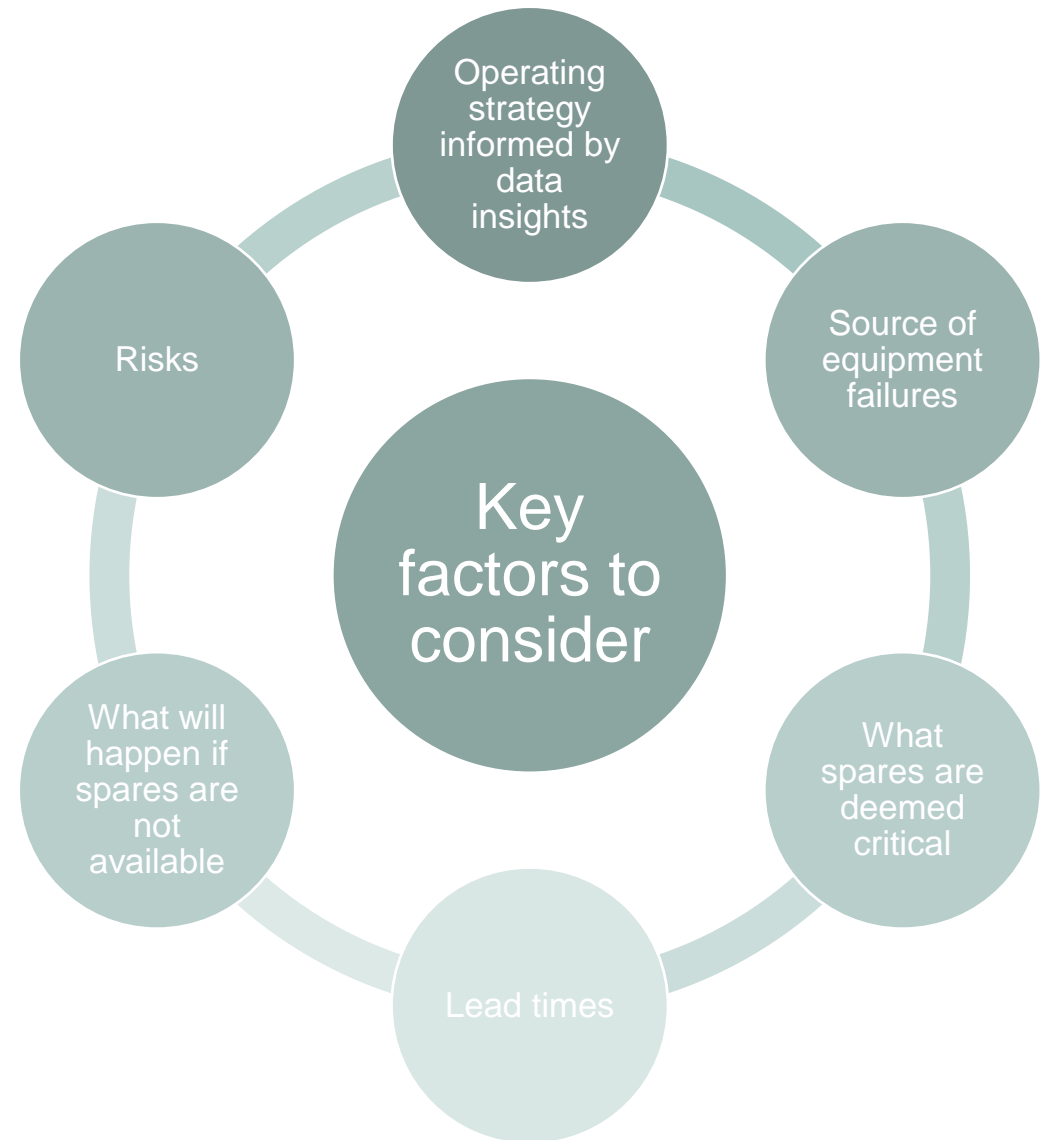
Activity	Description	Estimated cost
Circuit breaker replacement	Circuit breakers are old and pose reliability and safety risks. Project is to replace with current standard circuit breakers.	\$1.2M
Fire system upgrades	Fire system requires minor upgrades to maintain compliance with current standards.	\$0.5M
Replacement of major structural components	Replacement of corroded doors, filters, filter housing, noise attenuation.	\$0.2M
Cooling system major maintenance	Replacement of hoses, bellows and major overhauls of pumps.	\$0.4M

4: Spares management




Considerations for spares management

- Spares management is a critical issue for Directlink
 - Majority of the hardware at Directlink is from a sole source original manufacturer. This manufacturer has made decisions to make spare parts obsolete with limited notice. Lead times have also extended dramatically.
 - Global electrical supply chains have been negatively affected since COVID and have not recovered.
 - The cable is also specific to the asset and has a lead time between 5 and 7 years
- If we buy too many spares?
 - Higher purchasing and carrying costs (storage and insurance)
 - Consumers will pay too much
- If we don't buy enough spares?
 - Higher costs due to expediated manufacturing and shipping
 - Increased risk of extended outages
- A full review of the sparing strategy for each item is underway




Spares management

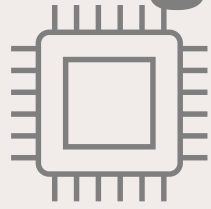
Why do we need to invest?	<ul style="list-style-type: none"> • Key electrical components have an increasingly long lead time post COVID and are becoming obsolete due to the sole source supplier ceasing to manufacture with limited notice • This is driving a refresh of our sparing strategy which has been acceptable to date, but is not sustainable for Directlink's reliable operation out to 2042
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Cable Length Options		
	 Option 1: Cable order for current regulatory period	Option 2: Cable order for remainder of asset life
What does it involve?	<ul style="list-style-type: none"> • Buying 1.5km of cable (5 to 7-year lead time) 	<ul style="list-style-type: none"> • Buying 3km of cable (5 to 7-year lead time)
Pros	<ul style="list-style-type: none"> • Less capex for the 2025-30 regulatory period • Lower carrying costs 	<ul style="list-style-type: none"> • 3km will provide sufficient spares for approximately 20 years based on current failure rates • Slightly reduced cost of cable for longer length
Cons	<ul style="list-style-type: none"> • Due to lengthy lead times, 1.5km may not be sufficient and result in lengthy outages 	<ul style="list-style-type: none"> • Additional storage facilities required • Customers will pay more than needed if cable is unused
2025-30 Capex	<ul style="list-style-type: none"> • \$2.9M 	<ul style="list-style-type: none"> • \$6.2M (includes additional storage facilities)
2025-30 Opex	<ul style="list-style-type: none"> • No change 	<ul style="list-style-type: none"> • No change

Spares management cont'd


Dry-HED Capacitor options (sole source from original manufacturer) Dry HED capacitors are units that form part of the converter system to convert AC to DC power		
	Option 1: Sparing for historical failure rate	 Option 2: Sparing for risk of increased failures* <small>*Increased failures observed at other sites</small>
What does it involve?	<ul style="list-style-type: none"> Procure 20 spare dry-HED capacitors for replacement of failed capacitors 	<ul style="list-style-type: none"> Procure 200 spare dry-HED capacitors for replacement of failed capacitors at increasing rate
Pros	<ul style="list-style-type: none"> Less capex for the 2025-30 regulatory period Lower carrying costs 	<ul style="list-style-type: none"> Sufficient spares to avoid lengthy outage to Directlink in the event of increasing failure rates Likely to be sufficient till the end of Directlink's life No need for an upgrade project in the event the manufacturer deems this spare part obsolete and no longer produces it in the future
Cons	<ul style="list-style-type: none"> Due to lengthy lead times, 20 may not be sufficient and result in lengthy outages 	<ul style="list-style-type: none"> Higher capex Storage required
2025-30 Capex	<ul style="list-style-type: none"> \$400k 	<ul style="list-style-type: none"> \$4M
2025-30 Opex	<ul style="list-style-type: none"> No change 	<ul style="list-style-type: none"> No change

5 Insulated-gate bipolar transistors (IGBTs)

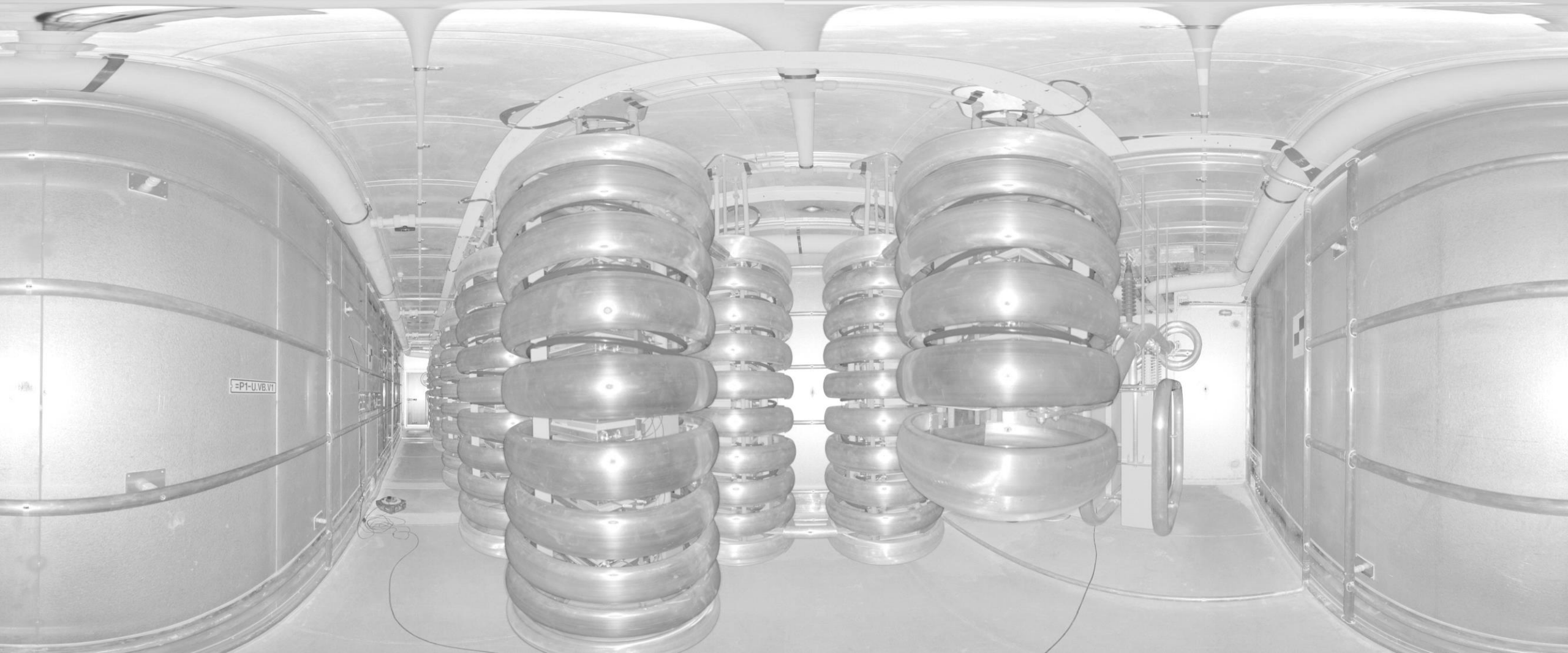


Insulated-gate bipolar transistors (IGBTs)

Why do we need to invest?	<ul style="list-style-type: none"> • Hitachi no longer provides support for, or manufactures and supplies, crucial inputs for Directlink’s existing generation 1 IGBTs • Generation 1 IGBTs are used in 5 of Directlink’s 6 converter buildings • The high failure rate of generation 1 IGBTs means the available number of spares has almost been exhausted
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	 In flight project summary
What does it involve?	<ul style="list-style-type: none"> • Replace Bungalora System 1, valve room VA and VB, generation one IGBTs positions with a newer version (generation 3 IGBTs) • The recovered IGBTs will be stored and used as spares for the remaining original IGBT based systems • Expenditure has been approved by the AER and Regulatory Investment Test – Transmission has been completed
Pros	<ul style="list-style-type: none"> • Obsolescence risk has been significantly reduced • Reduced risk of prolonged outages
Cons	<ul style="list-style-type: none"> • Total capital expenditure is significant
2025-30 Capex	<ul style="list-style-type: none"> • \$5.6M • Total investment over 2020-25 and 2025-30 is \$25.6M
2025-30 Opex	<ul style="list-style-type: none"> • \$0

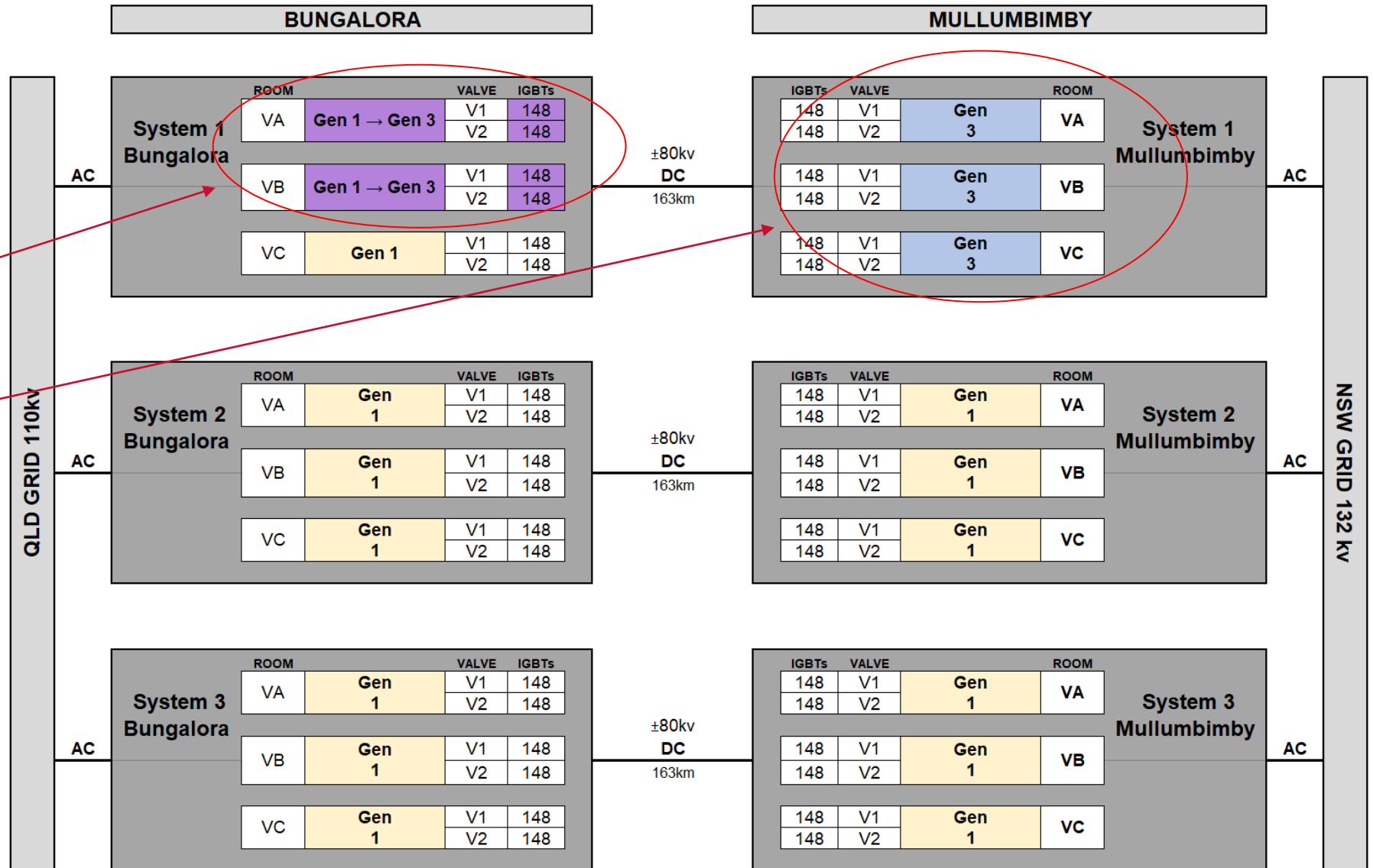
IGBT project upgrade – inside valve room



IGBTs project upgrade

Legend

- IGBTs Still to be replaced
- IGBTs replaced



Capital expenditure project not being taken forward

UNDERGROUNDING

- Undergrounding has been considered to prevent cable transition location failures and to prevent the risks associated with erosion/land slips.
- Due to the nature of the terrain, access issues and the length of the run to retrospectively underground the cable, undergrounding is expected to be very costly (in excess of \$150M).
- There would also likely be extended outages required to implement such a change.
- Cable faults have also occurred in the buried sections, and as such, it does not prevent cable faults from occurring.
- As such, APA has not explored further or proposed any projects to underground the cable route.

FIBRE OPTICS

- Running a fibre optic cable alongside each of the existing three cables to make it easier to find faults and reduce outage times has been considered.
- Fibre optic cables are estimated to reduce average outage times by 2 days, from 14 days to 12 days for each cable.
- However, there would still be a need to shut-down the relevant cable to find the fault and fibre optic cables are relatively costly.
- In light of the limited reliability benefit and high cost, APA has not explored fibre optics further at this stage.

Wrap up and next steps

Objective: To thank participants and explain next steps.

Next steps

- **Stakeholder group to:**
 - Complete evaluation survey for today's meeting
 - Advise on areas of interest for the next meeting on the forecast operating expenditure, RAB, depreciation, rate of return, cost pass through and pricing methodology for Directlink on **Wednesday 8 November, 10:00am – 11:30am**
- **APA to:**
 - Confirm agenda for the next meeting
 - Send out meeting papers for the next meeting by Wednesday 1 November



Questions

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Thank you

