

Draft Decision

Murraylink

**Transmission Determination 2023
to 2028**

(1 July 2023 to 30 June 2028)

**Attachment 5
Capital Expenditure**

September 2022

© Commonwealth of Australia 2022

This work is copyright. In addition to any use permitted under the *Copyright Act 1968* all material contained within this work is provided under a Creative Commons Attributions 3.0 Australia licence with the exception of:

- the Commonwealth Coat of Arms
- the ACCC and AER logos
- any illustration diagram, photograph or graphic over which the Australian Competition and Consumer Commission does not hold copyright but which may be part of or contained within this publication.

The details of the relevant licence conditions are available on the Creative Commons website as is the full legal code for the CC BY 3.0 AU licence.

Inquiries about this publication should be addressed to:

Australian Energy Regulator
GPO Box 520
Melbourne VIC 3001

Tel: 1300 585 165

AER reference: AER202186

Amendment record

Version	Date	Pages
Version 1	30 September 2022	23

Note

This attachment forms part of the AER’s draft decision on Murraylink’s 2023–28 transmission determination. It should be read with all other parts of the draft decision.

The draft decision includes the following documents:

Overview

Attachment 1 – Maximum allowed revenue

Attachment 2 – Regulated asset base

Attachment 3 – Rate of return

Attachment 4 – Regulatory depreciation

Attachment 5 – Capital expenditure

Attachment 6 – Operating expenditure

Attachment 7 – Corporate income tax

Attachment 8 – Efficiency benefit sharing scheme

Attachment 9 – Capital expenditure sharing scheme

Attachment 10 – Service target performance incentive scheme

Attachment 11 – Pricing methodology

Attachment 12 – Negotiated services

Contents

5	Capital expenditure	5
5.1	Draft decision.....	5
5.2	Murraylink’s proposal.....	6
5.3	Reasons for the draft decision	8
5.4	Obsolete Insulated Gate Bipolar Transistors and contingent project	18
5.5	Ex post statement of efficiency and prudence.....	20
A	Shortened forms	23

5 Capital expenditure

Capital expenditure (capex) refers to the investment made in the transmission network to provide prescribed transmission services. This investment mostly relates to assets with long lives (30-50 years is typical) and these costs are recovered over several regulatory periods. On an annual basis, the financing and depreciation costs associated with these assets are recovered (return of and on capital) as part of the building blocks that form Murraylink’s total revenue requirement.¹

Under the regulatory framework, Murraylink must include a total forecast of the capex that it considers is required to meet or manage expected demand, maintain the safety, reliability, quality, security of its network or comply with all applicable regulations (the capex objectives).²

We must decide whether or not we are satisfied that Murraylink’s forecast reasonably reflects prudent and efficient costs to maintain the safety, reliability and security of the interconnector, and a realistic expectation of future demand and cost inputs (the capex criteria).³ We must make our decision in a manner that will, or is likely to, deliver efficient outcomes that benefit consumers in the long term (as required under the National Electricity Objective (NEO)).

If we are not satisfied, we must set out the reasons for this decision and a substitute estimate of the total capex for the regulatory control period that we are satisfied reasonably reflects the capex criteria, taking into account the capex factors.

Murraylink proposed \$12.7 million (\$2022–23) in forecast capex that it considers is required to maintain its operations.⁴ This forecast capex is primarily for the replacement of assets that are reaching the end of their life, and infrastructure that supports the delivery of electricity transmission services. After submitting the proposal, in response to our information request, Murraylink identified some discrepancies in its proposed cost estimate for essential spares. Murraylink’s corrected capex forecast is now \$12.6 million (\$2022–23).⁵

This attachment sets out our draft decision on Murraylink’s forecast capex.

5.1 Draft decision

Overall, we are satisfied that Murraylink’s proposed total forecast capex of \$12.6 million (\$2022–23) reasonably reflects prudent and efficient costs to maintain the safety, reliability and security of the network. We determined an alternative estimate for capex of \$12.4 million because we did not accept Murraylink’s proposed \$0.2 million in regulatory reset costs. Our alternative capex forecast is not materially different to Murraylink’s capex forecast and we are satisfied that Murraylink’s estimate reasonably reflects the capex criteria.

¹ NER, cl. 6A.5.4(a).

² NER, cl. 6A.6.7(a)

³ NER, cl. 6A.6.7(c).

⁴ Murraylink, *Murraylink transmission determination 2023–28 – Overview*, 31 January 2022, p. 11.

⁵ Murraylink, *Response to information request AER IR001*, 11 April 2022. Murraylink provided an updated capex model to reflect this adjustment to its proposed capex forecast.

Table 5.1 outlines Murraylink’s forecast annual capex for the 2023–28 period.

Table 5.1 Draft decision on Murraylink’s forecast capex (\$2022–23, million)

	2022–23	2023–24	2024–25	2025–26	2026–27	Total
AER draft decision	4.3	4.3	2.5	0.7	0.8	12.6

Source: Murraylink, *Response to AER Information Request IR001*, 11 April 2022.

Note: Numbers may not add up to total due to rounding.

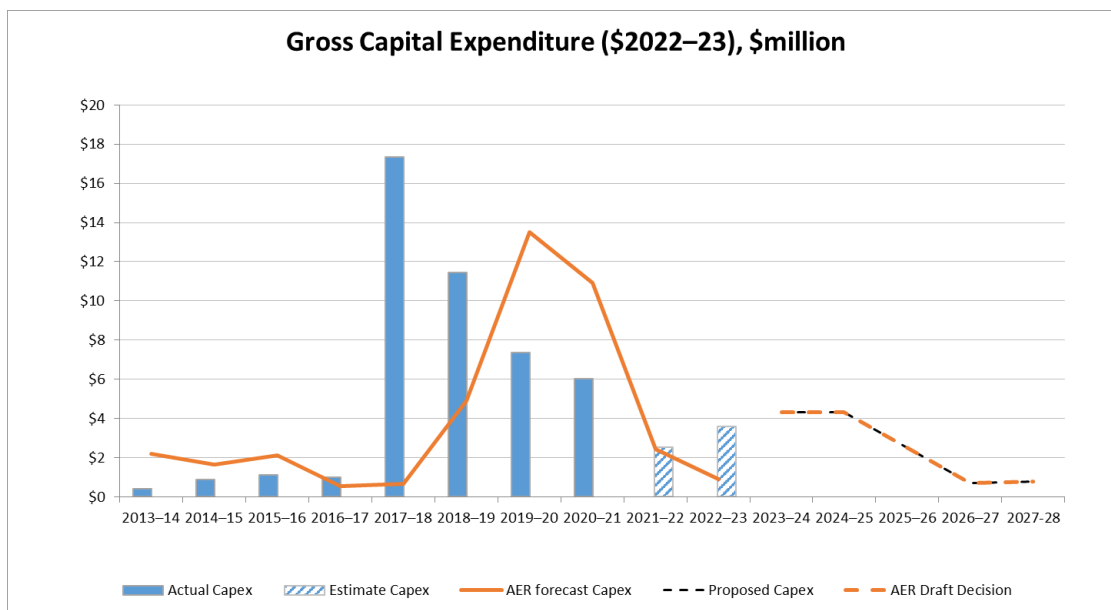
We do not approve a particular category of capex or specific projects, but rather an overall amount. As part of our assessment, we undertook a targeted review on specific categories of expenditure and particular projects in order to test whether Murraylink’s proposed total forecast capex reasonably reflects the capex criteria.

5.2 Murraylink’s proposal

Murraylink proposed forecast capex of \$12.7 million (\$2022–23) for the 2023–28 regulatory control period.⁶ This is a \$17.5 million (58%) decrease from its actual/expected expenditure for the 2018–23 regulatory control period, and also a reduction on prior periods. A key driver of capex in the current period was the replacement of the control and protection system (estimated actual capex of \$28.6 million). Murraylink’s proposal submitted in January 2022 did not include any capex projects of this scale for the 2023–28 period. Murraylink’s proposal did, however, identify an issue in regard to obsolete Insulated Gate Bipolar Transistors (IGBTs) and a proposed contingent project.

Figure 1 shows Murraylink’s proposed capex forecast compared to historic levels.

⁶ Murraylink has amended its proposed forecast capex from \$12.7 million to \$12.6 million (\$2022–23) due to identified discrepancies in its proposed cost estimate for essential spares.

Figure 1 Comparison of Murraylink’s past and forecast capex (\$2022–23, million)

Source: AER, Murraylink 2018–23 - Post-tax revenue model, April 2018; AER, Murraylink 2018–23 - Roll forward model, April 2018; Murraylink, Murraylink - Attachment 14 – PTRM, 31 January 2022; Murraylink, Murraylink - Attachment 03 - Reset RIN - Workbook 1 - Forecast and Historical, 31 January 2022.

5.2.1 Key drivers of the capex proposal

Murraylink’s proposed capex forecast is predominantly replacement capex (98.4% of total capex).⁷ This is made up of:⁸

- \$3.4 million for ‘Stay In Business’ projects, including
 - projects to replace aging equipment to prevent unplanned equipment failure
 - modifying the NSW runback scheme to meet the requirements of Project Energy Connect
 - SCADA upgrades; and
 - periodic refurbishment of rotating machinery.
- \$3.2 million for an enhanced cooling system to manage the heat generated by the ACDC conversion process
- \$2.4 million for cable protection and modification to prevent or mitigate unintended third-party interference with Murraylink’s cables; and
- \$1.7 million to mitigate the risks that threaten the reliable operation of Murraylink. This expenditure includes maintaining the reliability of the control system and flood mitigation measures.

Murraylink has also proposed \$0.2 million non-network expenditure for the preparation of its proposal.⁹

⁷ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 31.

⁸ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, pp. 26–31.

⁹ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 29.

5.2.2 Obsolete Insulated Gate Bipolar Transistors and proposed contingent project

Murraylink’s capex forecast did not include potential expenditure to replace obsolete IGBTs. An IGBT is a three-terminal power semi-conductor device primarily used as an electronic switch for high-voltage, high-current applications. IGBTs are an integral part of the operation of the Murraylink converter stations.

In December 2021, Murraylink was advised by the sole provider of IGBTs that the relevant IGBTs are no longer in production, and Murraylink would have access to only 115 new units.¹⁰ Given the limited access to spare IGBT’s, Murraylink considers that it would be necessary to replace its valve room sometime in the future, at an estimated cost of \$30 million dollars.¹¹ Murraylink has not proposed this upgrade as part of its capex program because of the uncertainty surrounding the failure rate of existing IGBT’s and its ability to access the remaining compatible IGBT stock. Instead, it has suggested the capex for this project could be considered a contingent project.

Obsolete IGBTs and the potential need for a contingent project are discussed in section 5.4.

5.3 Reasons for the draft decision

We reviewed Murraylink’s capex drivers, programs and projects to inform our view on a total capex forecast that reasonably reflects the capex criteria. We conducted top-down analysis such as examining trends and forecast costs compared with historical capex, and inter-relationships between cost categories. To complement this, we conducted bottom-up analysis of Murraylink’s specific major replacement programs and projects. We also requested further details from Murraylink regarding its proposed capex program in an information request.

In this draft decision, we are satisfied Murraylink’s total forecast capex reasonably reflects the capex criteria. Table 5.2 sets out the capex amounts by project that Murraylink included in its total forecast capex for the 2023–28 regulatory control period.

¹⁰ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 16.

¹¹ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 33.

Table 5.2 Murraylink forecast capex by project (\$2022–23, million)

Project	Total forecast capex
Stay-in-business	3.4
Enhanced cooling	3.2
Cable protection/Modification	2.4
Reliability	1.7
Essential spares	1.1
Security Legislation Amendment (Critical Infrastructure)	0.6
Regulatory reset	0.2
Total capex	12.6

Source: Murraylink, *Response to AER Information Request IR001*, 11 April 2022; Murraylink, *Transmission determination 2023–28 – Forecast Capex Model Update 01*, 11 April 2022 and AER analysis.

Note: Numbers may not add up due to rounding.

Our review of Murraylink’s proposed capex projects is presented below.

5.3.1 Stay-in-business capex

Murraylink broadly proposed three stay-in-business capex projects at a total forecast capex of \$3.4 million (\$2022–23):¹²

- replacement or refurbishment of aging equipment to prevent unplanned equipment failure and associated reduction in the reliability of transmission services
- modifying the runback schemes to meet the requirement of Project Energy Connect and the Western Victoria Transmission Network Project; and
- SCADA system upgrade, safe access improvements, reactor cooling pipework support replacement, and other low cost capex for operational improvements.

Murraylink submitted that this program of work is required to maintain the existing Murraylink functionality and the benefits provided by the Murraylink transmission services, and ensures Murraylink effectively meets its obligations for reliability and regulatory requirements.¹³ Murraylink also submitted that not modifying the Murraylink control system and NSW runback scheme equipment, to meet the requirement from changes to the surrounding AC network, will result in higher constraints applied to Murraylink, and an associated reduction in the benefit of the Murraylink transmission services.¹⁴

Murraylink included 13 projects in its stay-in-business capex forecast of \$3.4 million. These projects included rotating equipment refurbishment (\$0.8 million), NSW Runback scheme

¹² Murraylink, *Murraylink transmission determination 2023–28 – Forecast Capex Model Update 01*, 11 April 2022 and *Attachment 13 Business cases*, 31 January 2022, p. 2.

¹³ Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

¹⁴ Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

equipment (\$0.6 million), power quality metering (\$0.6 million) and SCADA upgrades, AC protection relay upgrades and reactor cooling pipework support replacement (\$0.3 million).¹⁵

We consider the stay-in-business capex is required to maintain Murraylink’s transmission services in order to meet its reliability and regulatory obligations. We also consider the consequences of Murraylink:

- not replacing aging equipment will increase the likelihood that Murraylink will operate with a higher risk of unplanned equipment failure and an associated reduction in the reliability of transmission services
- not modifying the NSW runback scheme to meet the requirement of Project Energy Connect is likely to lead to higher constraints applied to Murraylink
- not upgrading SCADA and AC protection relays will impact on Murraylink’s operating systems and increase the risk of unplanned interruption to transmission services
- not periodically refurbishing rotating machinery will potentially increase unplanned disruptions to transmission services.

We consider the 13 stay-in-business projects included in Murraylink’s proposed capex program are likely to be necessary and are satisfied that an amount of \$3.4 million (\$2022–23) is reasonably likely to reflect prudent and efficient costs.

The South Australian Department of Energy and Mining submission did not comment directly on the stay-in-business projects but recommended to Murraylink that this program, or the projects making up this program, be renamed to be more intuitive and informative to stakeholders.¹⁶

5.3.2 Enhanced cooling

Murraylink submitted that at ambient temperatures above 45 degrees Celsius its existing cooling systems struggle to reject heat generated by the AC-DC conversion process, ultimately leading to significantly reduced transmission capability. Murraylink proposes to install additional cooling equipment to ensure the cooling systems can reject the heat generated by the AC-DC conversion process, at times of high ambient temperatures. The purpose of the equipment is to enhance Murraylink’s cooling systems and improve its heat rejection capability. The proposed cost of the enhanced cooling is \$3.2 million (\$2022–23).¹⁷

Murraylink provided current data from electrical equipment manufacturer ABB which shows that at ambient temperatures above 40 degrees Celsius, Murraylink’s power transfer derates linearly down to 82.5 per cent at 45 degrees Celsius. Murraylink submitted that it is not able to effectively reject the heat generated from its operating equipment at ambient temperatures beyond 45 degrees Celsius. Murraylink also provided maximum temperature data from the Renmark airport, which is near Murraylink’s Berri converter station, which it claims supports the forecast for an increasing number of days above 45 degrees Celsius. By investing in an

¹⁵ Murraylink, *Murraylink transmission determination 2023–28 – Forecast Capex Model Update 01*, 11 April 2022.

¹⁶ South Australian Department of Energy and Mining, *Submission on Murraylink Revenue Proposal 2024-28*, 13 May 2022.

¹⁷ Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

enhanced cooling system, Murraylink considers its capacity can be maintained during an increasing number of hot days by mitigating derating.¹⁸

Murraylink also provided historical National Electricity Market (NEM) and temperature data, as well as its own technical data, which showed the cost of price separation events at high ambient temperatures was approximately \$6 million over five years from 2016 to 2020.¹⁹

Murraylink considers that enabling operation at full rated power for high ambient temperatures will maximise Murraylink’s contribution to minimising the price separation between Victoria and South Australia. Murraylink also considers that the proposed enhanced cooling system is expected to prolong the life of its IGBTs, deferring the need to incur the large plant upgrade cost, delivering further savings to electricity consumers.²⁰

Murraylink considered alternative options:²¹

- the do nothing option where during time of high ambient temperatures, Murraylink will derate its transmission capability to ensure equipment is not damaged
- the refrigeration chiller cooling option requiring annual hiring of refrigeration chillers and diesel generators and using the chillers to cool the air that is drawn in by the existing cooling systems. The estimated cost of this option is \$0.45 million per annum for 12 weeks of hire over the summer period. Murraylink considers that this is not the preferred option as it is dependent on hiring equipment at a predictable cost for the remaining life of Murraylink.

Murraylink’s preferred option is the evaporative cooling option which involves installing evaporative coolers to cool the air that is drawn in by the existing cooling systems. Murraylink considers that this option is preferred due to its controllable project cost and negligible lifetime running cost.²²

We consider that Murraylink’s proposed enhanced cooling project is likely to provide an economic benefit as well as maintaining the reliability of Murraylink, for the following reasons:

- it is more likely than not that Murraylink’s converter stations will experience an increase in the number of days of ambient temperatures above 40 degrees Celsius during the 2023–28 regulatory period
- recent historical data provided by Murraylink which shows that the cost of price separation events at high ambient temperatures are at a level that justifies the proposed expenditure to enable Murraylink to operate at full rated power, thereby maximising Murraylink’s contribution to minimising the price separation between Victoria and South Australia
- ElectraNet’s proposed Network Capability Incentive Parameter Action Plan (NCIPAP) for the 2023–28 regulatory period included a project to increase Murraylink’s transfer

¹⁸ Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

¹⁹ Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

²⁰ Murraylink, *Murraylink transmission determination 2023–28 – Overview - 31 January 2022*, p. 26.

²¹ Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

²² Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

capability.²³ This is an additional 15 MVar of reactive capacity to increase reactive power support in the Riverland region. The project is expected to increase the current Murraylink export limit by 15 MW.²⁴ We consider Murraylink’s proposed enhanced cooling project will increase the likelihood of Murraylink operating at full rated power, thereby increasing the potential for ElectraNet’s proposed NCIPAP project to deliver market benefits to customers through improved access to low cost generation by allowing the export of additional renewable generation from South Australia to Victoria

- the potential for the proposed enhanced cooling system to extend the life of Murraylink’s converter stations IGBTs.

For these reasons, we are satisfied that an amount of \$3.2 million (\$2022–23) is reasonably likely to reflect the prudent and efficient costs for Murraylink’s proposed enhanced cooling capex.

5.3.3 Cable protection and modification

In order to prevent or mitigate unintended third-party interference with its cables, Murraylink proposed the following projects:²⁵

- replacing the DC cables marker signage where the cables pass through public land; and
- relocating DC cables from the South Australian Government inspection station near the South Australia – Victoria border.

Murraylink considers the level of development activities surrounding this area is high and would potentially increase the frequency and complexity associated with cable fault repair. Murraylink also considers that the development activities pose a risk to the cable during construction.²⁶ The proposed cost of this project is \$2.4 million (\$2022–23).

Murraylink invests in protecting the underground high voltage DC cables from unintended third-party interference through a range of measures including:²⁷

- clear cable route signage for the public when they are near the cables; and
- coordinating with surrounding development activities (e.g., roadworks) to prevent such unintended interference.

Murraylink submitted that:²⁸

- the existing signage has been in place since the original cable installation and that the signs have faded, particularly the high visibility red “Danger” part of the signs
- development activities around Murraylink can unintentionally interfere with its cables

²³ ElectraNet, *ElectraNet transmission determination 2023–28 – Attachment 10, Appendix A: Network Capability Incentive Parameter Action Plan 2023-24 to 2027-28*, 31 January 2022.

²⁴ ElectraNet, *ElectraNet transmission determination 2023–28 – Attachment 10, Appendix A: Network Capability Incentive Parameter Action Plan 2023-24 to 2027-28*, 31 January 2022, pp. 21–22.

²⁵ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 27.

²⁶ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 27.

²⁷ Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

²⁸ Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

- it identified considerable development activities, including a new, larger fruit fly inspection station and major road works, on the southern side of the Sturt Highway, around the existing South Australian Government inspection station near the South Australia – Victoria border. Murraylink has proposed that the relevant section of the Murraylink cable be relocated away from the proposed roadworks on the southern side of the Sturt Highway
- the close proximity of buildings to the cables, and high level of activities around the area can significantly increase the likelihood of cable faults and the time required to repair such faults
- there are complex technical challenges associated with repairing a cable fault, making it infeasible under some circumstances
- the likelihood and time to repair a cable fault, in and around the fruit fly inspection station and the Monash-Berri intersection presents an unacceptable risk to the provision of its transmission services.

Murraylink’s proposed solution to prevent or mitigate unintended third-party interference with its cables is to replace the DC cables marker signs where the cables pass through public land and relocate the DC cables to the northern of the Sturt Highway, clear of the entire South Australian Government fruit fly inspection station.

To assist us in reviewing Murraylink’s proposed cable modification capex, we asked Murraylink to provide further details on:

- the composition of the Development Risk Management component (\$1.1 million) of the proposed cable modification capex; and
- whether Murraylink had considered alternative risk management practices such as covers, easements and third party arrangements where the level of development activities around its cables is, or is anticipated to be, high.

We have reviewed Murraylink’s proposal and response to our information request²⁹ and consider for the following reasons that Murraylink’s proposed cable protection and modification capex is likely to be necessary in maintaining the reliability and security of Murraylink:

- Murraylink’s signage is over 20 years old and it is likely the signs have deteriorated and faded to an extent this has diminished their deterrent value. We acknowledge that rejuvenating the signs to maintain their visibility is likely to become less effective with age. We also consider that with increased activity around Murraylink it may be prudent to increase the size of the signs to improve their visibility and deterrent effect
- we acknowledge increased activity and the close proximity of buildings to the cables at the Berri converter station can increase the likelihood of cable faults and the time required to repair such faults. We also consider there are technical challenges associated with repairing a cable fault and the proximity of buildings, other structures

²⁹ Murraylink, *Response to AER IR001*, 11 April 2022.

and road traffic can impact on the feasibility of a repair. In such circumstances it would be prudent to relocate the relevant section of cable

- although Murraylink’s alternative option of pre-planning for cable relocation would reduce the overall time required for the cable fault repair, we consider there is still a reasonable risk that significant disruption of the transmission services would still result from the work to relocate the Murraylink cables in the event of an unplanned fault
- we accept alternative risk management practices would not necessarily overcome the impact of a significant increase in activity to allow for effective repair of a cable fault in its original location.

For these reasons, we are satisfied that an amount of \$2.4 million (\$2022-23) is reasonably likely to reflect the prudent and efficient costs for Murraylink’s proposed cable protection and modification capex.

5.3.4 Reliability

Murraylink has proposed a program of work to mitigate the risks to its reliable operation. The program of work at a forecast capex of \$1.7 million (\$2022–23) includes:³⁰

- uninterruptable Power Supply (UPS) upgrade (\$0.8 million)
- flood mitigation measures (\$0.4 million); and
- Red Cliffs AC protection relay replacement (\$0.5 million).

Murraylink submitted that:³¹

- UPS systems are essential to maintaining the reliability of the control system. The UPS maintains power supply to the control and protection equipment in the event of an auxiliary power outage. Murraylink consider a UPS outage impacts the operation of Murraylink for a number of hours after the power is restored and the control and protection system must be checked for correct operation before allowing transmission services to resume
- the Red Cliffs converter station is located less than 50 metres from the Murray River and protected only by a levy bank on an adjoining property. Murraylink claim that should the levy fail, and flood waters enter the converter building, transmission services are expected to be disrupted for several weeks. Murraylink consider appropriate measures need to be in place to manage such a risk
- the AC cable between Murraylink and the Red Cliffs Terminal Station is protected by two protection relays that have reached the end of their useful life. Murraylink consider an unexpected failure of a protection relay will disrupt transmission services for a significant period of time and increase the risk of material damage to the AC cable.

³⁰ Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

³¹ Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

We consider Murraylink’s proposed reliability program of work is necessary to maintain the safe and reliable operation of Murraylink. A UPS system is necessary to maintain power supply to Murraylink’s control and protection equipment in the event of an auxiliary power outage and the AC cable upgrade is necessary as two protection relays have reached the end of their useful life. There is also an increased risk that the Red Cliffs converter station is subject to flooding.

We consider the reliability projects included in Murraylink’s proposed capex program are likely to be necessary and are satisfied that an amount of \$1.7 million (\$2022–23) is reasonably likely to reflect prudent and efficient costs.

5.3.5 Essential spares

Murraylink submitted its program of essential spares maintains Murraylink’s availability by ensuring spare parts are available to replace failed equipment as required. Murraylink stated that replacing spare parts as they are consumed ensures the inventory of spares is readily available to maintain reliability of its transmission services. Murraylink’s spare parts inventory covers all of its sub-systems including low voltage auxiliary power, cooling, air conditioning, control systems, and high voltage components. Murraylink’s proposed essential spares program includes the purchase of all spare parts, but excludes purchasing of spare IGBTs, which Murraylink considers are no longer available in the forthcoming regulatory period.³²

Murraylink’s proposal forecast essential spares capex of \$1.2 million (\$2022–23). This is a significant increase compared to the current period’s estimated essential spares capex of \$0.14 million. In response to our information request seeking an explanation for the apparent increase in forecast essential spares, Murraylink submitted that although historically it included purchases of IGBTs in this category, for the forecast period it separated IGBTs out as a separate forecast because of their impact on Murraylink’s proposed contingent project. Murraylink submitted that because the way APA’s inventory system works, the value of spares in that system meant spares were being issued to Murraylink at zero value during the current period.

Murraylink also acknowledged that it had overestimated its forecast essential spares for the following reasons:³³

- in reviewing its forecast for DryHed capacitors, Murraylink found the forecast was higher than its historic experience. In the current period there were two failures at Red Cliffs and with aging equipment its expectation is Murraylink will have three failures in the next five years across both the Red Cliffs and Berri converter stations
- the corrected forecast for capacitor units is based on the purchase of 39 units rather than the less precise estimate of 50 units in Murraylink’s proposal.

³² Murraylink, *Murraylink transmission determination 2023–28 – Attachment 13 Business cases*, 31 January 2022.

³³ Murraylink, *Response to AER#IR001*, 11 April 2022.

Murraylink acknowledged that its proposal overestimated forecast essential spares capex by \$0.1 million. Murraylink also provided an updated capex model to reflect this amendment to its forecast essential spares capex.³⁴

Given the potential long lead times for the procurement of equipment, we consider maintaining an inventory of spares is necessary for the timely restoration of Murraylink’s transmission services. We are satisfied that an amount of \$1.1 million (\$2022–23) is reasonably likely to reflect prudent and efficient costs.

5.3.6 Security Legislation Amendment (Critical Infrastructure)

This is critical infrastructure expenditure under the Security Legislation Amendment (Critical Infrastructure) Act 2021 (SOCi Act). Murraylink (and APA as this applies across the business) considers the SOCi Act arrangements increase the obligations and requirements APA must comply with and as a result, Murraylink is forecasting \$0.6 million (\$2022–23) in SOCi Act related costs.³⁵

As the SOCi Act expenditure was part of APA’s business strategy, we sought further information from Murraylink concerning APA’s overall SLACi Act compliance requirements and how the cost and the cost allocation between APA and Murraylink was determined. In response, Murraylink confirmed that the costs are Murraylink’s direct costs for the SOCi Act under the management agreement between Energy Infrastructure Investments (EII) and APA. Those costs associated with corporate level costs, for example human resources or information technology upgrades, are not chargeable under the agreement and there is no allocation of these costs to Murraylink.³⁶

Murraylink is considered a dispatchable facility which makes it a Tier 2 facility under the Facility Physical Security Control³⁷ and as a result are required to maintain a baseline for:³⁸

- deterring access – the physical assets that deter access to the facility, for example, fences and locked gates
- detection of access – the physical assets that enable detection
- delay of access – the physical assets designed to delay access inside facilities e.g. secure locked doors
- responding to access – the ability to respond to unauthorised access.

The expenditure forecast is on equipment to improve detection and integrate it into the APA national platform to enhance observation and response to physical intrusions.

³⁴ Murraylink, *Response to AER#IR001*, 11 April 2022.

³⁵ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, pp. 28–29.

³⁶ Murraylink, *Response to AER#IR001*, 11 April 2022.

³⁷ Murraylink, *Response to AER#IR001 – APA PROCEDURE RISK MANAGEMENT Facility Physical Security Control (confidential)*, 5 April 2022.

³⁸ Murraylink, *Response to AER#IR001*, 11 April 2022.

Having reviewed Murraylink’s proposal, including APA’s risk management procedure for its facility physical security control, and its responses to our information requests, we consider \$0.6 million for SOCI related physical security and systems is reasonable.

5.3.7 Regulatory reset costs

Murraylink proposed \$0.2 million (\$2022–23) capex for external costs incurred in the preparation of its transmission determination.³⁹ In our final decision for Murraylink’s 2018–23 revenue determination we stated:⁴⁰

Murraylink's revised proposal included capex of \$0.2 million (\$2017–18) for consumer engagement and revenue proposal costs. The Government of South Australia and CCP have recommended we do not accept this expenditure. Murraylink submitted that these costs are consistent with the NER as:

... it is necessary to comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services as the AER defines them.

In reviewing these costs, we consider (as did the CCP) that these costs are better characterised as opex rather than capex. This is consistent with Murraylink’s approach of depreciating these costs over a three year period, which indicates that these costs are effectively treated as an expense (opex). We have therefore applied our opex assessment approach in assessing these costs, which would treat these costs as an opex 'step change'. Relevantly, as these costs do not reflect a mandatory new obligation, they would not be considered as a 'step change' in costs to be compensated under our opex assessment framework. As such, we are not satisfied that these costs are likely to be prudent and efficient opex.

We consider these costs would be better characterised as opex costs and that they are not related to any new regulatory obligations. Our view is consistent with the SA Energy Division submission which opposes any cost transfers to consumers from undertaking engagement with customers as part of the normal operations of a network service provider, and does not support the inclusion of these costs in Murraylink’s proposal.⁴¹

5.3.8 Conclusion

We have determined an alternative estimate for capex of \$12.4 million (\$2022–23), having not accepted the \$0.2 million in regulatory reset costs. Our alternative estimate to Murraylink’s amended proposal of \$12.6 million is not materially different and on this basis, we are satisfied the amount of \$12.6 million (\$2022–23) reasonably reflects the capex criteria. This should provide Murraylink with a reasonable opportunity to recover at least its

³⁹ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 29.

⁴⁰ AER, *Final Decision, Murraylink transmission determination 2018 to 2023 - Attachment 6 – Capital expenditure*, April 2018, pp. 4–15.

⁴¹ South Australian Department of Energy and Mining, Energy and Technical Regulation, *Submission on Murraylink Revenue Proposal 2024-28*, 13 May 2022.

efficient costs.⁴² We acknowledge this may be subject to a holistic review in the context of any additional capex proposed by Murraylink in its revised proposal to address the risk of IGBT obsolescence.

5.4 Obsolete Insulated Gate Bipolar Transistors and contingent project

Murraylink’s capex forecast did not include anticipated expenditure to replace obsolete IGBTs. An IGBT is a three-terminal power semiconductor device primarily used as an electronic switch for high-voltage, high-current applications. IGBTs are an integral part of the operation of the Murraylink converter stations. In early engagement on its proposal, Murraylink proposed to purchase adequate spares to replace failing assets during the period (250 units, at an estimated cost of \$3.9 million).⁴³

In December 2021, Murraylink was advised by the sole provider of IGBTs, Hitachi (formally ABB), that the relevant units are no longer in production, and Murraylink would have access to only 115 new units.⁴⁴

Murraylink brought this to the attention of its Community Engagement Group and arranged a dedicated workshop in January to seek views on how to manage the uncertainty. Participants in that workshop accepted a process for further investigation and engagement on the options. This is to be done in parallel with our assessment of other elements of the proposal, with a view to presenting forecast capex for a preferred option in its revised proposal.

Potential options currently contemplated by Murraylink include the purchase of used IGBTs or new but unwanted units from other users of the technology, to increase Murraylink’s stock of spares and its ability to continue with the current technology for longer. Another option is a contingent project should it become necessary to replace its control and protection system within the 2023–28 control period.⁴⁵

Murraylink states it will likely have access to 145 older Generation 2 IGBTs available to keep it operating in its current configurations. At a predicted failure rate of 24 IGBTs per annum, Murraylink considers it could operate for six more years prior to the obsolescence of the Generation 2 IGBTs. At that point, Murraylink considers that it would be necessary to replace its valve room at an estimated cost of \$30 million.⁴⁶

Murraylink has not proposed this upgrade as part of its capex program because there is some uncertainty about the failure rate of Generation 2 IGBTs, which means the timing of the need to upgrade the valve room is uncertain. Instead, it has suggested that approval of

⁴² NEL, s.7A.

⁴³ Murraylink, *Murraylink IGBT Obsolescence - Presentation to the Murraylink Stakeholder Engagement Group*, 17 January 2022.

⁴⁴ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 16.

⁴⁵ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, pp. 33–36.

⁴⁶ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 33.

capex for this project could be a contingent project, subject to the following trigger events occurring:⁴⁷

- completion of a required Regulatory Investment Test – Transmission
- approval of the project by the EII Board
- the stock of spare IGBTs falling to a minimum level to enable confidence that they are likely to last until the replacement is complete (currently estimated at 72).

At this stage, Murraylink is still working with its Consumer Engagement Group in investigating potential solutions having engaged technical and economic consultants to look at the feasibility of various options. Murraylink’s Consumer Engagement Group met its consultants to analyse the options available for resolution of the obsolete IGBTs.⁴⁸ It is expected that the outcome of this process will be considered in Murraylink’s revised proposal in December 2022.

Murraylink has included contingent project triggers in its proposal, noting that these may be subject to further consultation ahead of its revised proposal. Should the contingent project become part of the solution ultimately identified, we would need to make a further assessment of any revised trigger events, including the need for the contingent project triggers to be well defined, demonstrate a reasonable need, and be easily verifiable and probable in the circumstances.

Our draft decision is to not accept Murraylink’s proposed contingent project for the replacement of the valve room for new generation IGBT’s given the uncertainty that still remains on the need for the contingent project. Further investigation and customer consultation is necessary and we may reconsider our position on the proposed contingent project at the final decision stage, pending the outcome of Murraylink’s customer engagement.

The SA Energy Division submission supported the on-going role of Murraylink as a valuable transmission asset to the South Australian power system, allowing the Australian Energy Market Operator (AEMO) to both utilise the interconnector as a controllable network element in parallel with the Heywood interconnector and allow the export of renewable energy generation that otherwise would have been curtailed. The SA Energy Division considers it is critical for Murraylink to resolve the obsolescence of the IGBT’s in a way that is consistent with the long-term interests of consumers of electricity in South Australia.⁴⁹

In its submission, the Energy Users’ Association of Australia (EUAA) questioned the future value of Murraylink when faced with a large contingent project and asked the AER to include

⁴⁷ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 16.

⁴⁸ Murraylink, *IGBT Economic Analysis Methodology Stakeholder Forum* ([chrome-extension://efaidnbmnnnibpcajpcqlclefindmkaj/https://www.apa.com.au/globalassets/our-services/other-energy-services/electricity-interconnectors/oakley-greenwood---stakeholder-engagement---proposed-method.pdf](https://www.apa.com.au/globalassets/our-services/other-energy-services/electricity-interconnectors/oakley-greenwood---stakeholder-engagement---proposed-method.pdf)), 28 June 2022.

⁴⁹ South Australian Department of Energy and Mining, Energy and Technical Regulation, *Submission on Murraylink Revenue Proposal 2024-28*, 13 May 2022.

a trigger to determine the value of Murraylink subsequent to the commissioning of Project Energy Connect (PEC) before proceeding with the contingent project.⁵⁰

We have not included the contingent project and its triggers in our draft decision given the uncertain and continued engagement on the IGBT solutions. This will be considered further in Murraylink’s revised proposal, in the event that Murraylink proposes a contingent project.

Murraylink is regulated under the National Electricity Law and National Electricity Rules and must comply with any directions given to it by AEMO,⁵¹ who is responsible for overseeing the operations and security of the NEM. We recognise the future services of Murraylink are likely to change as the network services and transmission constraints change with the commissioning of PEC during the regulatory control period. However, Murraylink’s obligations and service requirements for security of supply, reliability and safety remain unchanged and we need to consider Murraylink as an on-going concern under the regulatory framework.

5.5 Ex post statement of efficiency and prudence

We are required to provide a statement on whether the roll forward of the regulatory asset base from the previous period contributes to the achievement of the capital expenditure incentive objective.⁵² The capital expenditure incentive objective is to ensure that where the regulatory asset base is subject to adjustment in accordance with the NER, only expenditure that reasonably reflects the capex criteria is included in any increase in value of the regulatory asset base.⁵³

We have reviewed Murraylink’s capex performance for the 2017 to 2021 regulatory years. This assessment has considered Murraylink’s out-turn capex relative to the regulatory allowance given the incentive properties of the regulatory regime for a transmission business to minimise costs.

Where Murraylink has spent more than its capex allowance for these years, we can review the efficiency of this overspend and make a determination on the capex that should be rolled into the RAB.

Table 5.2 shows Murraylink’s actual net capex against the forecast regulatory allowance for this period, including the three years of the ex post review period. This shows that Murraylink has spent more than its capex allowance.

⁵⁰ Energy Users’ Association of Australia, *Submission on Murraylink Revenue Proposal 2024–28*, 9 May 2022.

⁵¹ Essential Services Commission of South Australia, *Electricity Transmission Licence - Murraylink Transmission Company Pty Limited*, cl. 13.4.

⁵² NER, cl. 6A.14.2(b).

⁵³ NER, cl. 6A.5A(a).

Table 5.2 Murraylink’s actual net capex versus capex allowance – 2017–21 regulatory control period (\$million, nominal)

Category	2016–17	2017–18	2018–19	2019–20	2020–21	Total
Total net capex allowance	0.4	0.5	4.8	13.1	10.3	29.2
Total net actual capex	0.9	15.5	10.6	6.8	5.5	39.3
Capex overspend / (underspend)	0.4	15.0	5.8	(6.3)	(4.8)	10.1

Source: Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, pp. 37–39 and AER.

Note: Numbers may not add up to total due to rounding.

Our analysis of Murraylink’s actual capex compared to its allowance over the 2017 to 2021 regulatory years shows an overspend of \$10.1 million (\$nominal) or 35%.

5.5.1 Reasons for differences between AER's allowance and Murraylink’s actual capex

Murraylink’s regulatory proposal identified two projects, control and protection system and fire suppression, that contributed \$37.4 million or 95 per cent of its capex between 2017 and 2021. Over the 2017 to 2021 regulatory years, the majority of Murraylink’s actual expenditure was on the control and protection system project (\$27.8 million) and was similar to that forecast (\$27.1 million), a variation of less than three per cent.⁵⁴ Murraylink attributed the remaining balance of the capex overspend of \$10.1 million to the fire suppression project, which was not included as a capex project in Murraylink’s previous regulatory proposal. This project was for the upgrade and additions to the existing fire detection system installed within both the Red Cliffs and Berri converter stations.⁵⁵

Murraylink provided the following justifications for its fire suppression project capex:⁵⁶

- in August 2012, Directlink’s Mullumbimby 1 converter station burnt down as a result of a fire and did not return to service until August 2015. Murraylink submitted that following the fire at the Mullumbimby converter station it became apparent that the fire suppression arrangements at both Directlink and Murraylink were insufficient to protect the stations. Murraylink and Directlink both had fire detection equipment that would set off alarms in the event that fire is detected but no automated capability to combat a fire should it break out or threaten to break out
- between the commissioning of Murraylink and Directlink there were 1,128 converter building operational months before the fire in the Directlink converter station in August 2012. On this basis, Murraylink determined that in any month there is a one in 1,128 possibility that one converter station will be destroyed in the absence of fire suppression equipment.

⁵⁴ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 38.

⁵⁵ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 38.

⁵⁶ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 38.

Murraylink submitted that:

- if it loses a converter station the entire capacity of Murraylink is taken offline. Murraylink also submitted that under the APA risk matrix, a one in 1,128 event in any month is considered a high likelihood event and that the complete loss of Murraylink operations is a high consequence event. On this basis, Murraylink ranked the loss of a converter station from a fire as a high risk event. Murraylink submitted that by installing fire suppression equipment, the likelihood of the risk is reduced to low, and is consistent with the NER requirement for Murraylink to maintain the quality, reliability and security of supply of prescribed transmission services.⁵⁷
- the \$9.6 million capex for the upgrade and additions to the existing fire detection system installed within both the Red Cliffs and Berri converter stations included:⁵⁸
 - new fire detection control and indicating equipment
 - new networked fire detection systems
 - wet pipe sprinkler systems
 - new fire hydrant system for manual fire protection at both sites
 - new inert gas suppression system-for the following risk areas:
 - main control room
 - IGBT valve control enclosures, and;
 - associated water storage tanks, pump rooms, pump sets, piping reticulation, fire indicator panels, control and power cabling, light and power and any other facilities required for the proper operation of the proposed additional detection and suppression systems.

We reviewed the prudence and efficiency of Murraylink’s fire system suppression capex. We consider that based on the fire at Directlink’s Mullumbimby 1 converter station in 2012, it is prudent for Murraylink’s converter stations to have fire suppression systems and that this is likely to be consistent with good electricity industry practice. In regard to cost, we asked Murraylink whether any or all of the fire suppression system components installed within the Red Cliffs and Berri converter stations were competitively tendered. Murraylink confirmed that the installation of Murraylink’s fire suppression equipment was competitively tendered and of the three responses to its request for proposal the successful tenderer was the lowest cost tender.⁵⁹ On this basis, we are satisfied that Murraylink’s actual capex should be rolled into the RAB.

⁵⁷ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 38

⁵⁸ Murraylink, *Murraylink transmission determination 2023–28 - Overview - 31 January 2022*, p. 39.

⁵⁹ Murraylink, *Response to AER#IR001*, 11 April 2022.

A Shortened forms

Shortened form	Extended form
AEMO	Australian Energy Market Operator
Capex	Capital Expenditure
IGBT	Insulated Gate Bipolar Transistors
NCIPAP	Network Capability Incentive Parameter Action Plan
NEL	National Electricity Law
NEO	National Electricity Objective
NER	National Electricity Rules
PEC	Project Energy Connect
PTRM	Post-tax revenue model
RIN	Regulatory Information Notice
TNSP	Transmission network service provider
UPS	Uninterruptable Power Supply