

Business Case Assessment Report











This document has been produced by Tasmanian Networks Pty Ltd, ABN 24 167 357 299 (hereafter referred to as "TasNetworks").

Enquiries regarding this document should be addressed to:

Bess Clark General Manager Project Marinus PO Box 606 Moonah TAS 7009

Email: team@marinuslink.com.au

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Executive Summary

By 2035 at least 12,000 megawatts (**MW**) of coal-fired generation is forecast to retire in the National Electricity Market (**NEM**). Replacing this will require a combination of resources, including variable renewable generation, storage, and dispatchable 'on demand' generation.

Marinus Link and supporting transmission unlock Tasmania's clean, cost-competitive generation and storage resources. Together they are part of the lowest cost solution to provide dispatchable energy to the NEM where and when it's needed.

The Business Case Assessment shows that a 1500 MW Marinus Link and supporting transmission are feasible and provide greater benefits than costs under all modelled scenarios.

Work will continue to progress this to a 'shovel ready' national infrastructure project, able to be in service from 2027.

TasNetworks' analysis shows that Marinus Link and the associated supporting transmission will support Australia's transition to a low emissions future by delivering the low cost, reliable, and clean energy that customers expect. The investment will provide additional dispatchable capacity across Bass Strait to support a transforming NEM.

The Business Case Assessment is that Marinus Link and supporting transmission provide substantially greater benefits than costs under all scenarios modelled and can provide a commercial rate of return to owners as a regulated service. The analysis shows that the optimal interconnection capacity is 1500 MW, built in two physically separate links of 750 MW each. This capacity provides energy market and broader economic benefits.

TasNetworks has undertaken an assessment of the scope and timing of the project, considering requirements of the NEM regulatory investment test for transmission (**RIT-T**). The RIT-T is applied to large investments proposed in the 'shared' transmission network, which moves energy between electricity generators and customers in the NEM. The test includes economic analysis and consultation to ensure that customers only pay for transmission investments that provide greater benefits than costs.





TasNetworks' analysis is that the optimal timing for Marinus Link and supporting transmission under the RIT-T is for the first 750 MW of capacity to be in service in 2028. Depending on the scenario used, the timing of the second 750 MW of capacity is between 2030 and 2032. TasNetworks continues to work with the Australian Energy Market Operator (**AEMO**) as it prepares its draft and final 2019-20 Integrated System Plan (**ISP**), which considers future transmission investment needs for the NEM.¹ Recognising that differences in modelling assumptions may result in different timings between TasNetworks and AEMO analysis, work undertaken by AEMO and TasNetworks makes it clear that Marinus Link will play a role in the future NEM and that the project should proceed through the Design and Approvals phase.

The project is therefore being progressed in a manner that provides the option to deliver the first stage in 2027 and the second stage in 2028. This timing reflects the expected time to complete the project Design and Approvals phase activities, in addition to manufacturing, construction, and commissioning activities.

2027 is referred to as the 'target date' from which the project could start providing services to the NEM. Bringing the in-service date forward from the RIT-T timing provides options if external factors change in the NEM when compared to the scenarios modelled. While a 2027 target date does not presently optimise benefits under the RIT-T, this timing would still provide net benefits to the NEM over the project's life under all scenarios modelled. This is indicated in Figure 1 below.

¹ AEMO is the power system operator and national planner for the NEM, and jurisdictional planner for Victoria. Material produced to date relating to the 2019-20 ISP is available here: <u>https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planningand-forecasting/Integrated-System-Plan/2019-Integrated-System-Plan.</u>







Figure 1 Net market benefits with Marinus Link and Supporting Transmission in service in 2027 and 2028 across scenarios²

TasNetworks' analysis shows Marinus Link and supporting transmission will provide significant benefits to the energy market in excess of the estimated cost, both capital and operating, over the study period.³ The net energy market benefits are estimated to be between \$600 million and potentially up to \$3.1 billion depending on the scenario considered.⁴ The benefits to the NEM that Marinus Link and supporting transmission would unlock include:

- Enabling untapped and cost-competitive renewable wind, solar, and long-duration (**deep**⁵) pumped hydro energy storage;
- Increasing supply security and firming renewables by providing clean, dispatchable energy;
- Harnessing a diversity of load and generation;
- Managing the risks of relying on a single interconnector across Bass Strait;
- Complementarity with existing and future interconnectors on mainland Australia; and

² Data sourced from TasNetworks, *Project Marinus Regulatory Investment Test for Transmission Project Assessment Draft Report*, December 2019, Section 6.1, Table 11 and reflect an in-service date of 2027-2028. Hereafter referred to as "*PADR*".

³ The study period is from is 1 July 2020 to 30 June 2050. The net market benefits of Marinus Link and supporting transmission accrue from the in-service date (2027-28), through to the end of the study period (2050).

⁴ Unless otherwise specified, all dollar amounts are expressed in 2019 dollars. Estimated net energy market benefits are sourced from *PADR*, Section 6.1, Table 11, and reflect an in-service date of 2027-2028.

⁵ In referring to energy storage systems, 'depth' often refers to the energy to capacity ratio, where a 'deep' storage system has a high energy to capacity ratio. This means that it can operate for long periods at high output before exhausting its energy storages. Storage 'depth' is a reference to how long that storage would last. It is independent of the peak capacity of the system.

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• Utilising robust and flexible converter technology to provide services to support the power system.

From a practical perspective, these benefits mean the cost of electricity supply in the NEM would be relatively lower with Marinus Link in service. In a competitive energy market, this should translate to relatively lower electricity prices for customers in the NEM than prices otherwise would have been without Marinus Link and supporting transmission.

Marinus Link and supporting transmission will also stimulate significant economic growth and jobs, particularly in regional communities in Tasmania and Victoria. The broader direct and indirect economic contribution from the construction and operation of the project alone is forecast to be potentially up to \$2.9 billion.⁶ This contribution could be in the form of increased employment and economic value added to regional communities. Marinus Link and supporting transmission could also unlock wider added value to the Tasmanian economy estimated to be up to \$5.7 billion.⁷ For instance, the additional 1500 MW capacity across Bass Strait would unlock renewable energy developments such as Hydro Tasmania's Battery of the Nation project and wind generation developments in Tasmania.

This growth will, in turn, generate skills and opportunities in regional Tasmania and Victoria to support Australia's continuing transition to a cleaner energy sector. The project continues to work with industry, government, and skills bodies to capture the vast social, economic, and employment opportunities that Marinus Link and supporting transmission unlocks in Tasmania and regional Victoria.

The optimal technical solution has been identified, enabling 1500 MW of capacity across the high voltage direct current (**HVDC**) Marinus Link. The technical design has two components to help maintain power system stability and ensure that no more than 750 MW of load would be lost in a credible contingency event.⁸ The link connects to the high voltage alternating current (**AC**) transmission network via converter stations in Tasmania and Victoria, and is supported by AC transmission network upgrades in Tasmania to enable efficient transport of energy to and from the link. In Victoria, the link will connect to the existing transmission network at the Hazelwood Substation, which has sufficient capacity to accommodate flows to and from Marinus Link.

The supporting transmission in Tasmania has been considered as part of TasNetworks' North West Tasmania Strategic Transmission Plan to efficiently facilitate Marinus Link connection and additional generation and pumped hydro energy storage developments that Marinus Link will unlock in the region. This includes development of resources forecast in the North West Tasmanian Renewable Energy Zone (**REZ**) identified by both AEMO and TasNetworks.⁹

⁶ Ernst & Young, *The Economic Contribution of Marinus Link and Supporting Transmission*, November 2019.

⁷ Ernst & Young, The Economic Contribution of Marinus Link and Supporting Transmission, November 2019.

⁸ Credible contingency events are events considered to be reasonably possible to occur. Typically, a credible contingency event involves the unplanned tripping of any single item of network or generation equipment.

⁹ In this document, REZ refers to a cluster of existing renewable generator and / potential renewable generation resources within an approximate geographic boundary that are, or would be, connected within the shared transmission network.

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In addition to increasing energy capacity and security across Bass Strait, Marinus Link and supporting transmission will materially increase the optical fibre routes across Bass Strait. This will support greater telecommunications diversity and security between Tasmania and mainland Australia.

A route has been identified that has sought to minimise local impact on communities and the environment. To date, work undertaken for the environmental, planning, and cultural heritage approvals indicates that the selected route for Marinus Link and supporting transmission is feasible. As part of the broader project schedule, all the requisite steps have been worked through to identify a credible and achievable approvals timeframe. The environment, planning, and cultural heritage approvals process is on the critical path to reach a Final Investment Decision (**FID**) for Marinus Link and supporting transmission.

Following best practice engagement principles the project continues to raise awareness and understanding of Marinus Link and supporting transmission and its impacts. This includes engagement undertaken and planned on preliminary route options, environmental and cultural matters, pricing challenges, economic benefits and costs, and the business case assessment process.

A RIT-T Project Assessment Draft Report (*PADR*) has been prepared in accordance with National Electricity Rules (**NER**) requirements. The assessment shows that Marinus Link and supporting transmission deliver a net market benefit and should proceed.¹⁰ With a successful RIT-T, and consequent regulated revenue allowance, Marinus Link and supporting transmission can provide a commercial rate of return to owners as a regulated service.

A range of possible ownership, funding, and commercial options are open to the project. New pricing arrangements will need to be agreed to achieve fair pricing outcomes. In November 2019, this issue was recognised by the Council of Australian Governments (**COAG**) Energy Council, which requested the Energy Security Board (**ESB**) to provide advice on a fair cost allocation methodology for interconnectors. TasNetworks has prepared a discussion paper to seek stakeholders' views, which will inform a submission to the ESB's anticipated consultation on this issue. An appropriate pricing outcome is required for the project to proceed.

Further government infrastructure contributions to underwrite the project, such as those recently announced to support timely development of the Queensland to New South Wales interconnector upgrade, can also ensure that the national benefits from Marinus Link and supporting transmission are delivered in a timely way.¹¹

Marinus Link and supporting transmission are national infrastructure that provide cost-competitive dispatchable energy for customers in a transforming market. Alternative solutions to provide similar reliability

¹⁰ The full PADR and summary document is available here: <u>https://www.marinuslink.com.au/rit-t-process/</u>.

On 28 October 2019, the Australian and New South Wales Governments announced they will jointly underwrite up to \$102 million of the New South Wales-Queensland Interconnector upgrade to ensure the security of electricity in NSW. Scott Morrison (Prime Minister of Australia) and Angus Taylor (Minister for Energy and Emissions Reduction), "Ensuring the Future of Reliable Electricity Supply for NSW", media release, 28 October 2019, <u>https://www.liberal.org.au/latest-news/2019/10/28/ensuring-future-reliable-</u> <u>electricity-supply-nsw</u>.





in the NEM would come at a higher cost. The Business Case Assessment is to progress a 'shovel ready' Marinus Link and supporting transmission to be 'shovel ready' and able to be in service from 2027.





1 Context

In December 2017, TasNetworks established Project Marinus to undertake a detailed Feasibility and Business Case Assessment into further Bass Strait interconnection. The analysis considers Marinus Link; a new HVDC transmission interconnector between Tasmania and Victoria, and the associated supporting AC transmission development required to support an efficient interconnection capacity. The analysis also considers telecommunications services that Marinus Link can provide, using new optical fibre cables to improve telecommunications diversity and security between Tasmania and mainland Australia.

The Feasibility and Business Case Assessment is jointly funded by the Tasmanian Government through TasNetworks and the Australian Government through the Australian Renewable Energy Agency (**ARENA**).

A Feasible Project

TasNetworks has undertaken extensive analysis of Marinus Link and the supporting transmission. The *Initial Feasibility Report* for Marinus Link and supporting transmission was prepared in December 2018 and publicly released in February 2019. This report found that Marinus Link and supporting transmission "would be a strategic interconnection investment that would provide NEM-wide economic benefits".¹² Also in February 2019, the Australian Government provided additional funding of \$56 million to fast track the Design and Approvals phase, recognising the strategic benefits that the project can provide to the nation.

In March 2019, Infrastructure Australia relisted Marinus Link and supporting transmission as a high priority initiative as part of a future, more interconnected, NEM.¹³ The project also received bipartisan support from both major political parties at the Federal election held in May 2019.¹⁴

In July 2019, AEMO released an Insights Paper that highlights the important role for Marinus Link and Tasmania's deep pumped hydro energy storage resources in Australia's future electricity grid. In particular, the Insights Paper recognises the ability for Marinus Link and supporting transmission to:

¹² TasNetworks, *Project Marinus Initial Feasibility Report Overview*, February 2019, p. 9. A copy of this overview, in addition to the full *Initial Feasibility Report*, can be accessed here: <u>https://projectmarinus.tasnetworks.com.au/initial-feasibility-report/</u>.

¹³ Marinus Link was also listed as a high priority initiative by Infrastructure Australia in 2018. For further information, see: <u>https://www.infrastructureaustralia.gov.au/sites/default/files/2019-07/ia18-4005_priority_list_2019_acc_h_0.pdf</u>

¹⁴ The Prime Minister reiterated support for Marinus Link and supporting transmission on 9 April 2019. See Scott Morrison (Prime Minister of Australia), "Doorstop - Ulverstone Tasmania", media release, 9 April 2019, <u>https://www.pm.gov.au/media/doorstop-ulverstone-tasmania</u>. The Leader of the Opposition highlighted support for the project on 2 May 2019. See Bill Shorten (Leader of the Opposition), Labor to Deliver a Renewable Future for North West Tasmania", media release, 2 May 2019, <u>https://www.billshorten.com.au/labor to deliver a renewable future for north west tasmania thursday 2 may 2019.</u>





- Increase transfer capability between Tasmania and Victoria to allow additional renewable generation and storage capability to be exported to mainland Australia;
- Increase system resilience in case of early plant closure and overall power system security; and
- Reduce transmission costs involved in integrating renewable generation and the decline in marginal loss factors.¹⁵

The further analysis undertaken by TasNetworks confirms the project's business case and the need to progress Marinus Link and supporting transmission in a timely way.

The Business Case Assessment

Extensive analysis has continued over the course of 2019. The project has identified the preferred route, undertaken more detailed economic and technical modelling, conducted thorough modelling and analysis to assess the commercial, financial, and environmental viability of the project, and continued engagement with stakeholders including government, industry, customers, and communities. This Business Case Assessment summarises the findings from this body of work, which together show that there is a positive business case for progressing Marinus Link and supporting transmission to FID.

The assessment includes an outline of the further work required across the technical, economic, commercial, financial, environmental, and engagement activities to achieve a 'shovel ready' project, able to be in service when required. The assessment is that Marinus Link and supporting transmission should progress so that the project can be in service from 2027, in time to meet the energy market's changing needs.

¹⁵ AEMO, *Building Power System Resilience with Pumped Hydro Energy Storage*, July 2019, p. 4.







Figure 2 Project feasibility and Business Case Assessment flowchart

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Supporting information

There are a number of other reports and documents that support the detail contained in this Business Case Assessment.

The economic analysis, which is at the heart of this Business Case Assessment, draws on work undertaken as part of the RIT-T process for Marinus Link and supporting transmission. The RIT-T process involves a comparative analysis of a future NEM with and without Marinus Link and supporting transmission. The analysis considers a range of possible future scenarios affecting the energy market (a global slow down, a continuation of the status quo and current policies, a sustained renewables uptake, and an accelerated transition scenario), and further considers a range of sensitivities that may affect these scenarios (such as the early retirement of coal or an extended Basslink outage). These scenarios are used to model the potential economic benefits that an investment in Marinus Link and supporting transmission can deliver to the NEM compared to the network, generation, and storage investments, and reliability outcomes expected without Marinus Link and supporting transmission.

The RIT-T process determines if Marinus Link and supporting transmission provide more market benefits than costs and meet the requirements to become a regulated service. The second stage of the RIT-T – the *PADR* – is available for public consultation. Seeking stakeholder feedback on the RIT-T analysis and findings is a critical component of the RIT-T process; TasNetworks will hold information sessions to further explain the RIT-T analysis and welcomes submissions on the *PADR*. Further information on this consultation process, including a link to the report, is available here: https://www.marinuslink.com.au/rit-t-process/.

The RIT-T analysis is limited to consideration of benefits to the electricity market only; the RIT-T process does not consider the broader economic benefits a transmission investment might offer, nor does it fully take into account how a transmission investment might provide insurance for, and increase the resilience of, the NEM. While such factors may not alter whether or not a transmission investment is worthwhile as a regulated asset, they can affect the optimal timing for investment. The economic analysis and Business Case Assessment therefore takes into account the broader economic contribution that Marinus Link and supporting transmission will provide beyond the electricity market.

Additional reports and documents that support the detail contained in this Business Case Assessment are included in the reference list at the end of the document. Where available, weblinks to these reports and documents have been provided in the reference list.

All values in this document are expressed in 2019 real dollar terms unless otherwise stated.¹⁶

¹⁶ Real dollars do not include the effects of, and are not adjusted for inflation and reference the cost, set according to a given year. They are often called 'today's dollars'.





2 A Strategic Investment for the Nation

Marinus Link and supporting transmission will help Australia's transition to a low emissions future by unlocking Tasmania's renewable energy and storage resources to provide energy when it's needed, for less.

By providing access to clean, dispatchable energy capacity, Marinus Link and supporting transmission can play a critical role in Australia's energy transition.

The NEM is experiencing unprecedented and rapid change. By 2035, at least 12,000 MW of coal generation is expected to reach end-of-life and retire (see, for example, Figure 2).¹⁷



Figure 3 NEM coal-fired generation retirement

¹⁷ Data sourced from AEMO, Generation Information webpage, June 2019, <u>https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information.</u>





In its role as the national transmission planner, AEMO published its inaugural ISP for the NEM in July 2018.¹⁸ In that landmark planning document, AEMO highlighted that a significant number of coal-fired generators have either advised that they are closing, or will reach the expected end-of-technical-life, during the next 20 years. AEMO engaged Aurora Energy Research to understand the economics of coal closure under the four scenarios outlined in the 2018 ISP. Aurora Energy Research concluded that under AEMO's 'slow change' scenario, between 3 GW and 5 GW of coal generation is estimated to retire prematurely.¹⁹

This dispatchable energy capacity will need replacing to meet customer energy requirements. While wind and solar are now the lowest cost sources of energy generation, these variable resources need 'firming' capacity from dispatchable generation and storage to ensure customer energy needs are met.

Modelling shows that the NEM will need 40,000 MW of variable renewables, such as wind and solar generation, and at least 8,000 MW of dispatchable generation, such as hydroelectric and gas generation, together with deep storage capacity from pumped hydro resources, to meet customer energy requirements and replace the dispatchable energy capacity that is expected to retire by 2035.²⁰



Figure 4 Requirements of the NEM by 2035

In the July 2019 Insights Paper, AEMO notes the important contribution of pumped hydro energy storage in a future NEM owing to its ability to provide the large-scale deep storage required to absorb excess generation within the system, and provide on-demand generation as it is needed. In the same paper AEMO highlights that, when variable renewable energy availability is low, deep storage resources such as Snowy 2.0 and Tasmania's Battery of the Nation pumped hydro storage facilities can deliver higher savings in fuel costs than short-term storage solutions.²¹

¹⁸ AEMO, Integrated System Plan, July 2018.

¹⁹ Aurora Energy Research, Analysis of AEMO's ISP Part 2: Economics of Coal Closure, May 2019, Finding 3, p. 12.

²⁰ Figures sourced from Ernst & Young, *Project Marinus Project Assessment Draft Report Market Modelling Report*, November 2019, Attachment 1 of the *PADR*. Hereafter referred to as "Ernst & Young, *Market Modelling Report*".

²¹ AEMO, Building Power System Resilience with Pumped Hydro Energy Storage, July 2019, p. 6.





New generation and storage capacity will predominantly come from large-scale energy developments that are significantly supplemented by customer demand response, and small-scale generation and storage, including residential solar panels, batteries, and smart converter technologies.²² New transmission, generation, and storage developments will need to be connected and coordinated in a manner that maintains energy security and reliability within the NEM, while also ensuring that the most cost-effective outcomes are delivered for end-use customers.²³



Figure 5 The Energy Trilemma

A whole-of-system redevelopment is underway across the NEM to facilitate this transition to a low emissions future, and Marinus Link and supporting transmission have enormous potential to support this critical process.²⁴

According to AEMO's analysis in the 2018 ISP, "retiring coal plants can be most economically replaced with a portfolio of utilityscale renewable generation, storage, distributed energy resources, flexible thermal capacity, and transmission." AEMO, *Integrated System Plan*, July 2018, page 5.

²³ Otherwise known as the 'energy trilemma'.

AEMO's 2018 ISP provides a blueprint for this whole of system redevelopment. Writing in its capacity as the national transmission planner, AEMO's ISP has "modelled and outlined targeted investment portfolios that can minimise total resource costs, support consumer value, and provide system access to the least cost supply resources over the next 20 years to facilitate the smooth transition of Australia's evolving power system." (*Integrated System Plan*, July 2018, p. 3). AEMO has also released an Insights Paper and two independent reports that provide further analysis and insights into the ISP. Links to these documents are provided in the reference list at the end of this report. AEMO will be releasing its draft 2019-20 ISP in December 2019, with the final report due for release in June 2020.





Part of the least cost solution

Marinus Link and supporting transmission has enormous potential to support the transformation that is underway, providing the NEM with access to some of Australia's most cost-competitive renewable energy and storage resources. A number of studies have highlighted Tasmania's wealth in renewable energy resources.²⁵ These resources include existing hydroelectric generators that have capacity available at times of peak demand in the NEM, cost-competitive deep pumped hydro energy storage potential, and an abundance of world-class wind resources. By 2035 Tasmania's energy and storage capacity resources could include:

- Approximately 400 MW existing hydro generation capacity without upgrades;
- Approximately 250 MW of further hydro generation capacity with moderate upgrades;
- At least 750 MW of new pumped hydro energy storage in close proximity to transmission; and
- At least 2,000 MW of new wind development.²⁶

These are cost-competitive energy and storage capacity resources, and offer greater value when compared to similar developments on the mainland. Tasmanian deep pumped hydro energy storage has a 30 per cent lower capital cost (\$1.3 million/MW compared to \$1.8 million/MW) and a storage duration typically four times longer than modelled mainland Australia projects; an advantage that reduces the need for peaking generation elsewhere.²⁷ Tasmanian wind has a 25 per cent higher energy output when compared to mainland Australia wind generation due to higher capacity factors, and the capital costs for Tasmanian wind and solar generation are comparable to those on mainland Australia at \$1.8 million/MW and \$0.9 million/MW respectively.²⁸

²⁵ See, for instance, AEMO, 2018 ISP Appendices, July 2018, Appendix A, pp. 35-8, and Hydro Tasmania, *Battery of the Nation: Analysis of the future National Electricity Market*, April 2018, p. 2.

²⁶ Data sourced from Ernst & Young, *Market Modelling Report*, November 2019.

²⁷ AEMO, 2019 Input and Assumptions Workbook, Version 1.0, released on 5 February 2019.

²⁸ AEMO, 2019 Input and Assumptions Workbook.







Figure 6 A least cost solution for the NEM

Victoria's customers would benefit from accessing Tasmania's dispatchable energy and firming capacity as wind and solar generation increases.²⁹ Furthermore, Tasmania would become an additional customer for excess generation, efficiently using and storing surplus Victorian renewable energy. Customers in New South Wales, South Australia, and Queensland would also benefit from greater access to Tasmania's cost-competitive energy and storage resources. New transmission investment between Tasmania and Victoria is required to unlock these potential benefits for the NEM.

Marinus Link and supporting transmission present a cost-effective, low regrets investment in national infrastructure.

²⁹ Hydro Tasmania's White Paper considers this benefit. *How Battery of the Nation Can Contribute to Victoria's Energy Needs and Objectives*, August 2019, p 8.





Critical national infrastructure

The assessment is that benefits provided to the NEM by Marinus Link and supporting transmission will significantly outweigh their costs. The positive net benefits realised by the project remain whether or not other interconnector projects go ahead. Indeed, our analysis indicates that Marinus Link and supporting transmission will complement the value that projects such as Project EnergyConnect and KerangLink will provide to the NEM.



Figure 7 Future interconnection in the southern NEM

These transmission investments will strengthen the transmission network, increase its resilience, and facilitate access to high value renewable energy zones where there is no network or no network capacity at present to unlock low cost, abundant, clean energy. Together, these new investments will be a critical part of a more





interconnected NEM, able to harness load and generation resource diversity to deliver energy at lowest cost to customers.³⁰

The CSIRO has identified that a failure to progress with projects that support Australia's transition to a low emissions future risks contributing to a 'slow decline', in which economic, social, and environmental outcomes are weak.³¹ Reserve Bank Governor Philip Lowe has also stressed the importance of major infrastructure developments as a source of stimulus for economic growth.³² Marinus Link and supporting transmission meet these needs, providing national infrastructure that support clean, reliable, and low cost energy solutions for Australia.

Our analysis shows that, as the NEM continues to evolve, further Bass Strait interconnection beyond Marinus Link will be required in the coming decades to adequately support Australia's future energy needs. This further investment will help the NEM to manage energy supply and system stability risks, and support affordable customer outcomes into the future.

Value in being ready

Transmission projects, especially undersea and land cables, require long lead times.³³ The NEM is also undergoing rapid and significant change. AEMO's analysis recognises the insurance value that comes with progressing transmission investments given the uncertain stability and reliability the energy market faces with the possible early retirement of coal.³⁴

AEMO also outlines positive support for progressing environmental and NEM regulatory approvals for Marinus Link and supporting transmission, and calls for Marinus Link and all future transmission projects identified in the ISP to be subject to an expedited post RIT-T regulatory approvals process.³⁵

³⁰ In August 2019, for example, Project EnergyConnect was deemed a project of Critical State Significant Infrastructure under the *Environmental Planning and Assessment Act 1979* by the New South Wales Government. See *Environmental Planning and Assessment Amendment (Project EnergyConnect (SA to NSW Electricity Interconnector)) Order 2019*, 8 August 2019.

³¹ CSIRO, Australian National Outlook 2019.

³² Eryk Bagshaw, reports that Lowe has ""urged the Morrison government to get infrastructure projects 'shovel-ready' in case they are needed for an emergency stimulus to pull Australia out of an economic downturn", in "RBA governor says infrastructure spending should be run like monetary policy", *Sydney Morning Herald*, 24 June 2019, <u>https://www.smh.com.au/politics/federal/rba-governorsays-infrastructure-spending-should-be-run-like-monetary-policy-20190624-p520qg.html</u>. More recently, Shane Wright reports that "all governments have been encouraged by the Reserve Bank to bring forward infrastructure projects in a bid to drive down the national unemployment rate and push up wages." "Frydenberg urges infrastructure wish list from states to boost economy", *The Age*, 11 October 2019, <u>https://www.theage.com.au/politics/federal/frydenberg-urges-infrastructure-wishlist-from-states-to-boosteconomy-20191011-p52zuh.html</u>.

³³ Construction alone for COBRAcable, a 325 km 700 MW undersea HVDC cable between the Netherlands and Denmark, took just under 4 years.

³⁴ AEMO, *Building Power System Resilience*, July 2019, p. 14.

³⁵ AEMO, Building Power System Resilience, July 2019, p. 19





In this context, there is a strong case for progressing Marinus Link and supporting transmission to being 'shovel ready' in a timely manner. Failure to do so risks a more expensive, more emissions-intensive energy market for Australia.





3 Economic Feasibility

Economic analysis for the project has considered the electricity market benefits of Marinus Link and supporting transmission to customers in the NEM measured under the RIT-T, and also the broader economic contribution of the project.

The analysis demonstrates that Marinus Link and supporting transmission will provide an economic advantage to Australia, with benefits significantly outweighing costs in all modelled scenarios.

The analysis also shows that a 1500 MW Marinus Link would deliver the most benefits to customers, with a range of optimal timing outcomes depending on the assumptions.

Broader economic analysis indicates a significant economic contribution from the development, construction, and operation of Marinus Link and supporting transmission, including value forecast to be potentially up to \$2.9 billion and 2,800 jobs.³⁶ The project also unlocks a pipeline of investment in renewable energy and storage development, with an estimated value of up to \$5.7 billion and 2,350 jobs.³⁷

TasNetworks' analysis has considered a range of factors that influence the appropriate timing for the interconnector to be in service. This analysis indicates Marinus Link and supporting transmission could be in service from 2027.

³⁶ Jobs figure represents estimated direct and indirect jobs at peak construction for the period spanning 2025 to 2027. Figures sourced from Ernst & Young, *The Economic Contribution of Marinus Link and Supporting Transmission*, November 2019.

³⁷ Jobs figure represents the estimated average of direct and indirect jobs at peak construction for the period spanning from 2030 to 2034. Figures sourced from: Ernst & Young, *The Economic Contribution of Marinus Link and Supporting Transmission*, November 2019.

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Meeting Customers' Needs

At the core of the economic analysis for Marinus Link and supporting transmission is a comprehensive cost benefit analysis: the RIT-T.³⁸ This analysis examines whether and when the project should proceed, having regard to all other alternative investment and expenditure options for meeting customers' demand for electricity over the next 30 years.

The RIT-T for Marinus Link and supporting transmission considers the quantifiable costs and benefits to the NEM that would arise from an increase of transmission capacity between Victoria and Tasmania, with that increased capacity assessed from 600 MW to 1500 MW. It determines if Marinus Link and supporting transmission provide more market benefits than costs, and meet the requirements to become a regulated service. As part of the cost-benefit analysis for the RIT-T, Ernst & Young was engaged to undertake extensive modelling to identify the lowest cost combination of generation, demand-side response, and transmission developments, including options for expanding interconnector capacities between different NEM regions.³⁹

The second stage of the RIT-T – the *Project Assessment Draft Report* – has been completed and supports the business case assessment, showing that benefits to the NEM exceed costs in all modelled scenarios. The *PADR* also shows that a 1500 MW Marinus Link would deliver the most benefits to the NEM, with a range of optimal timing outcomes depending on the assumptions.⁴⁰

RIT-T Modelling

Scenarios

Modelling for the Marinus Link and supporting transmission RIT-T takes into account four scenarios that reflect different future states of the world that could drive different economic outcomes for the NEM. These scenarios are broadly aligned with those outlined in AEMO's 2019-20 ISP.

The four scenarios adopted are:

• Global slowdown, which represents a reduced demand for energy and commodities, including a fall in gas prices;

³⁸ The RIT-T is a cost-benefit analysis of all major network investments in the NEM. It assesses the need, economic and technical impact of, and preferred timing for, a network investment. Projects can only pass the RIT-T and then be built as a regulated asset if the overall energy market benefits they provide outweigh the costs of investment.

³⁹ The full report detailing this modelling is included in Attachment 1 of the *PADR*.

⁴⁰ The full PADR and summary document is available here: https://www.marinuslink.com.au/rit-t-process/.

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- Status quo / current policy, which represents current NEM demand profile and government policy;
- Sustained renewables uptake, which assumes that the growth in renewables continues at the current pace until 2030; and
- Accelerated transition to a low emissions future, which includes an emissions reduction trajectory that is required to meet the Paris Agreement on climate change and an increase in NEM demand resulting from an accelerated uptake in electric vehicles.⁴¹

AEMO has developed a fifth scenario, "High DER" (Distributed Energy Resources), for which the modelling in this project has no direct equivalent. The essential characteristic of this scenario is a more rapid move away from centralised generation and transmission infrastructure to consumer-level generation, energy storage, and demand response. Examination of the impact of a mass uptake of consumer-level generation and storage solutions is modelled in our analysis via a sensitivity study, in which the cost of battery storage is drastically reduced, in place of developing an equivalent scenario to High DER.

Consistent with AEMO's approach, hydrogen generation has not been modelled in detail, although our sensitivity analysis has considered a hydrogen development in Northern Tasmania. A number of NEM states, including Tasmania, are developing strategies and investing in trials to further explore this resource. The project will continue to monitor this progress, including work with AEMO, to take into account the potential impact the hydrogen industry may have.⁴²

Modelling methodology

Potential market benefits for the future NEM have been calculated using Ernst & Young's electricity market expansion model, the "Time Sequential Integrated Resource Planner" (**the market model**). The market model facilitates a highly complex simultaneous assessment of numerous electricity market benefits, which shows what will be the least cost transformation of the NEM over the period 2020–2050.⁴³ This cost is expressed in 2019 dollar terms.

The market model's computation includes consideration of the most appropriate timing and technology for new generation and the timing for the retirement of existing generation due to end-of-life or economic factors. It takes into account a range of alternative generation, transmission, storage, and demand-side management solutions across all NEM regions.⁴⁴ This includes consideration of other and complementary transmission projects, such as KerangLink.

⁴¹ These scenarios, and how they have been used in the modelling, are outlined in more detail in *PADR*, Section 5.3.

⁴² In the 2019 Planning and Forecasting Consultation Paper, AEMO notes that "further research and development is required before hydrogen can be included as an ISP scenario, but work activities planned for this year should place AEMO in a better position to consider the role of hydrogen in future studies". February 2019, p. 16.

⁴³ Marinus Link would be expected to have a forty-year design life, but modelling beyond 2050 was not possible due to the absence of demand forecast data beyond 2050.

⁴⁴ Demand-side management is the modification of consumer demand for energy through various methods, such as incentivising large customers to reduce their load in times of high demand.





The market model has been run a number of times for each scenario to determine:

- The NEM-wide costs that would occur without Marinus Link and supporting transmission (but with other interconnector upgrades included); and
- The NEM-wide costs that would occur with Marinus Link and supporting transmission (with a capacity range from 600 MW to 1500 MW) built in a given year, or years, for staged construction.

The difference between the costs that would occur with Marinus Link and supporting transmission in operation and those without it represents the net market benefits resulting from that scenario.⁴⁵

Estimated costs

The analysis to date estimates Marinus Link and supporting transmission would have a total project cost in the range of \$3.5 billion, which includes an allowance for level of accuracy and contingencies. This includes an approximate cost of \$3 billion for the HVDC link and an approximate cost of \$500 million for the required supporting transmission. These costs include telecommunications assets associated with the HVDC link and supporting transmission.⁴⁶

The project cost estimates outlined above include allowances for accuracy and contingency appropriate for this stage in the project's lifecycle. The allowances reflect that the estimates for project elements are subject to a number of factors that may influence total project costs. In particular, the costs of the construction phase may be affected by:

- Variations in foreign exchange rates and commodity prices;
- Geotechnical and subsea conditions which have not yet been fully surveyed these results will assist to further refine the design of the technical solution and cost estimate;
- Environmental regulatory requirements which have been estimated at a high-level and will be adjusted following completion of the required environmental assessments;

⁴⁵ For a more detailed account of the modelling used to calculate the energy market benefits of Marinus Link and supporting transmission, refer to *PADR*, Section 5 and Ernst & Young, *Market Modelling Report*, in Attachment 1 of the *PADR*.

⁴⁶ The specific inputs used to calculate the estimated project costs are commercial in confidence. The costs for the HVDC link have been estimated using a combination of budget pricing received from HVDC component manufacturers, supplier quotes for equipment installation and estimates of civil construction requirements based upon experience with similar works. The costs for the supporting transmission have been estimated using per-unit costs based on TasNetworks' prior experience with AC network upgrades.





- Prevailing weather conditions that may impact the construction of Marinus Link and supporting transmission, particularly the installation of the subsea cable; and
- Other prevailing market conditions at the time of procurement, including access to appropriately skilled labour for a project of this size.

For the purpose of the RIT-T analysis, a different cost estimation methodology has been used which complies with the requirements of the RIT-T process. In particular, this estimation method is only for future electricity transmission costs and excludes allowances for accuracy and contingencies to give an expected project cost. This methodology results in a RIT-T cost estimate for the project of \$2.8 billion.⁴⁷

Assumptions

Since the *Initial Feasibility Report*, the market modelling assumptions used by Ernst & Young have been updated to instead use those published in February 2019 by AEMO.⁴⁸ AEMO revised these assumptions further in August 2019, and then again in September 2019. By September, Ernst & Young's market modelling was nearing completion and substantial delays would have resulted if all input assumptions had been updated to match AEMO's latest dataset. The sensitivity analysis (discussed below) has been used to understand the impacts of key changes in AEMO's most recent assumptions. TasNetworks continues to work with AEMO as it finalises its 2019-20 ISP, and as TasNetworks finalises its RIT-T.

Key Findings

The analysis shows that the benefits of Marinus Link and supporting transmission exceed costs in all modelled scenarios.

Since the publication of the *Initial Feasibility Report* in February 2019, the market modelling has shown an increase to the overall market benefits of Marinus Link and supporting transmission. Specifically, the modelling indicates material increases to economic benefits that are the result of:

- Improved modelling of REZs within the NEM;
- The forecast electricity demand for the NEM (forecast provided by AEMO);
- Enhanced hydrological modelling of the Tasmanian energy system;
- A more detailed representation of the retirement timeframe for ageing generation assets across the NEM; and

⁴⁷ For a full account of the project cost estimates used for the RIT-T analysis, refer to *PADR*, Appendix 2 – Cost Analysis for Each Credible Option.

⁴⁸ AEMO, *2019 Input and Assumptions Workbook*, Version 1.0, released on 5 February 2019. For more information on the market modelling assumptions TasNetworks has used, refer to *PADR*, Section 5.





• Increasing Marinus Link's capacity to 1500 MW.

How Marinus Link and supporting transmission benefit the NEM

The analysis indicates Marinus Link and supporting transmission will provide benefits to the NEM through:

- Reducing the capital costs of future generation, energy storage, and transmission augmentation;
- Reductions in the operating and maintenance costs of generators (including reduced fuel costs);
- Lessening the risk of blackouts;
- Reducing the need for customers' voluntary load curtailment; and
- Reducing the costs of ancillary services.

Marinus Link and supporting transmission provide a market benefit because the investment allows existing Tasmanian hydro generation to be used to provide energy storage for variable renewable generation, which will replace base load coal generators as they retire. The combination of existing hydro generation, cheaper pumped hydro storage in Tasmania, and Marinus Link, allows energy storage to be provided more cheaply than the alternative of building storage and using gas generation in mainland NEM regions. Additional higher quality Tasmanian wind resources can also be developed economically once the increased energy transfer capacity provided by Marinus Link and supporting transmission exists. Overall, this will support lower energy prices for mainland NEM customers.⁴⁹

Robustness of results

It is important for any economic case to check sources of uncertainty and thereby ensure the analysis is robust. This has been done through an extensive sensitivity analysis of the market model's results. A sensitivity analysis involves consideration of how key factors would influence the economic value of Marinus Link and supporting transmission as well as how they may alter the optimal timing to bring the interconnector into service.

The sensitivity analysis has been tailored in response to stakeholder feedback, the RIT-T Application Guidelines, and insights gained from the *Initial Feasibility Report*.

⁴⁹ For a more detailed discussion, refer to *PADR*, Section 6.4.





Based on work for the *Initial Feasibility Report*, it was known that the parameters with the biggest impact on results would be:

- Gas prices;
- Load forecasts in the NEM;
- Retirement timing of coal generators; and
- Emissions reduction targets.⁵⁰

A range of different values for each of these parameters were applied to each of the four scenarios. A number of separate sensitivity analyses have also been run, including the possibility of:

- Further reductions in gas prices;
- 500 MW of additional Tasmanian wind development;
- Other expected projects (such as KerangLink and Snowy 2.0) not proceeding;
- A positive Underwriting New Generation Investment (UNGI) decision to progress at least 600 MW of pumped hydro energy storage in Tasmania by 2027;
- An extended Basslink outage;
- Reduced battery costs (and therefore an increase in distributed energy resources across the NEM);⁵¹
- Late retirement of coal generators; and
- Reduced rainfall to all hydro power systems in Australia.

A notable finding from the sensitivity analysis is the complementarity of Marinus Link and KerangLink. The economic analysis shows that the NEM will need both of these developments as Australia transitions toward a low emissions energy market.

The sensitivity analysis also shows that, under all scenarios, there is a positive economic benefit to having Marinus Link and supporting transmission in service from 2027.⁵²

RIT-T benefits and timing

Over the life of Marinus Link and supporting transmission, benefits to the NEM include:

⁵⁰ TasNetworks, *Initial Feasibility Report*, p. 101.

⁵¹ This sensitivity tested the impact that reduced battery costs or increased battery storage capacity would have on the the benefits of Marinus Link as a substitute for AEMO's High DER scenario. For further detail, see *PADR*, Appendix 4.

two sensitivity studies to understand the impact that reduced battery costs or increased battery storage capacity would have on the viability Marinus Link

⁵² For a more detailed discussion of the sensitivity analysis, refer to *PADR*, Section 5.4 and Appendix 4.





- Enabling untapped and cost-competitive renewable wind, solar, and deep pumped hydro energy storage;
- Increasing supply security and firming renewables by providing clean, dispatchable energy;
- Harnessing a diversity of load and generation;
- Managing the risks of relying on a single interconnector across Bass Strait;
- Complementarity with existing and future interconnectors on mainland Australia; and
- Utilising robust and flexible converter technology to provide services to support the power system.

The RIT-T modelling shows that the optimal timing for Marinus Link and supporting transmission is for the transmission capacity to be provided in two stages – the first stage in 2028 and the second stage in 2032. This staging reflects the RIT-T requirement to select the optimal timing that delivers greatest net benefits across the scenarios, which effectively involves an averaging of outcomes under the four scenarios. However, it is also necessary to take into account variations in the timing for the second stage under the four scenarios. With the first stage in service from 2028, the timing for the second stage is 2030, rather than 2032, under two of the four scenarios (see Figure 8 Timing of Marinus Link under different scenarios). Therefore, the economic analysis suggests that the second stage could either be in 2030 or 2032, depending on future developments in the NEM.







Figure 8 Timing of Marinus Link under different scenarios

In addition to progressing the RIT-T analysis, TasNetworks continues to work with AEMO as it prepares its draft and final 2019-20 ISP, presently expected in December 2019 and March 2020. The 2019-20 ISP considers future transmission investment needs for the NEM under a range of scenarios. Differences in modelling assumptions may result in different timings between TasNetworks and AEMO analysis, however work undertaken by AEMO and TasNetworks makes it clear that Marinus Link is one of a number of new transmission interconnectors that will play a role in the future NEM, and that work to progress Marinus Link through the Design and Approvals phase to FID should proceed.

Other benefits

The benefits outlined above are pertinent to the RIT-T process and the broader Business Case Assessment. The analysis for this Business Case Assessment has also considered a broader range of benefits. This includes non-quantifiable benefits, such as the reduced spill that the Tasmanian hydro system would experience during times of high rainfall as a result of the additional 1500 MW capacity provided by Marinus Link and supporting transmission.





Other benefits considered are the broader economic value that would be added directly and indirectly as a result of expenditure and activity in regional communities, discussed further below.⁵³ There is also economic value added from the telecommunications infrastructure included in Marinus Link and supporting transmission, which will support greater telecommunications capacity, competition, and security between Tasmania and mainland Australia.

Broader Economic Contribution

Marinus Link and supporting transmission will bring investment and ongoing employment to regional communities in Tasmania and the Latrobe Valley in Victoria. Since the publication of the *Initial Feasibility Report*, assessment of the broader economic contribution that will be generated from the development, construction, and operation of Marinus Link and supporting transmission has been updated. Economic analysis undertaken by Ernst & Young shows significant value added in regional Tasmania and Victoria from the investment, over the multi-year construction phase, and for ongoing operation and maintenance of the assets. Marinus Link and supporting transmission will also unlock a pipeline of renewable energy and storage development, and the economic value that flow from these investments. The scale and scope of Marinus Link and supporting transmission will also stimulate significant broader economic growth in these regions.

Ernst & Young estimates that, in Tasmania, the direct economic value added from building Marinus Link and supporting transmission is estimated to be up to \$380 million, supporting approximately 280 direct jobs at the peak of construction.⁵⁴ This includes roles in engineering, a range of trades, planning and surveying, accountancy and finance, law, safety, and marine logistics and transport. The indirect value added from building Marinus link and supporting transmission in Tasmania during construction is estimated to be up to \$630 million and to support approximately 1,100 jobs in a range of sectors. The direct and indirect job estimates are for the peak construction period, spanning from 2025 to 2027. Over their operational life, Marinus Link and supporting transmission are also estimated to add up to \$350 million value to the Tasmanian economy.⁵⁵

⁵³ The broader economic value includes the direct and indirect economic contribution to gross state product and employment that would arise from the development, construction, and operation of Marinus Link and supporting transmission, including from other energy projects that Marinus Link and supporting transmission would enable.

⁵⁴ Ernst & Young, The Economic Contribution of Marinus Link and Supporting Transmission, November 2019. Ernst & Young's economic contribution modelling only takes into account the years following an in-service date of 2027-2028 through to 2050, whereas the assets are expected to have a 40-plus life expectancy. Given this, the overall economic contribution from Marinus Link and supporting transmission is expected to be even greater than the numbers quoted here.

⁵⁵ This estimate includes direct and indirect jobs. Ernst & Young, *The Economic Contribution of Marinus Link and Supporting Transmission.*





Induced value added from the renewable energy and storage investment that flow from Marinus Link are estimated to be potentially up to a further \$5.7 billion and an estimated 2,350 additional direct and indirect jobs.⁵⁶ The Australian Government's \$17 million *Energising Tasmania* skills initiative will further support realisation of benefits for Tasmanian communities. Funding from this initiative will provide fee-free training in priority areas such as project management, civil construction, electro-technology and engineering skills.⁵⁷

The direct economic value added from building Marinus Link in Victoria is in the range of \$325 million, supporting approximately 220 direct jobs at the peak of construction. In Victoria, approximately 1,170 jobs and up to \$755 million would be added to the economy indirectly during construction of Marinus Link.⁵⁸ A further estimated \$420 million would be added to the Victorian economy directly and indirectly over the operational life of Marinus Link.⁵⁹

The project is supporting a Tasmanian working group, led by the Cradle Coast Authority, which is partnering with the education sector, government, and energy businesses, to capitalise on the potential jobs and growth of Marinus Link and supporting transmission for the region. In Victoria, the project is working with the Latrobe Valley Authority as it similarly seeks to realise the regional value that this, and other renewable energy projects, provide. In both regions, three key principles guide this vision for economic development:

- Create and energise regional prosperity through a pipeline of jobs;
- Build on the legacy of energy expertise, with innovation in next generation renewable energy that is done well, with support from community; and
- Deliver a regionally-driven, generous contribution to the nation.

The benefits to the NEM and broader economic contribution of Marinus Link and supporting transmission are summarised in Figure 9 below.

⁵⁶ The data for induced value is calculated under the "Accelerated Transition" scenario. Jobs figure represents the estimated average of direct and indirect jobs at peak construction for the period spanning from 2030 to 2034. Data and figure sourced from: Ernst & Young, *The Economic Contribution of Marinus Link and Supporting Transmission*, November 2019.

⁵⁷ See Scott Morrison (Prime Minister of Australia), "Skills and Training for Tasmania's Future", media release, 9 April 2019, https://www.pm.gov.au/media/skills-and-training-tasmanias-future.

⁵⁸ Similar to Tasmania, the Victorian jobs estimate represents the peak construction period, spanning from 2025 to 2027.

⁵⁹ Ernst & Young, *The Economic Contribution of Marinus Link and Supporting Transmission*.







Figure 9 Marinus Link and supporting transmission benefits

In addition to the energy market benefits and economic contribution arising from the project, development of Marinus Link and supporting transmission will unlock cleaner energy solutions for Australia, estimated to reduce at least 45 million tonnes of carbon dioxide (**CO2**) emissions from the NEM by 2050.⁶⁰

Target date

In addition to considering the optimal timing assessed under the RIT-T, TasNetworks has considered the expected timing to complete Design and Approvals activities, and to manufacture, construct, and commission the assets. This planning indicates that the first stage of Marinus Link could be in service in 2027 and the second stage in 2028.

⁶⁰ Figures are based on Ernst & Young's analysis of generation profiles with and without Marinus Link, undertaken for the Marinus Link and supporting transmission market modelling. See Ernst & Young, *Market Modelling Report*.





As noted earlier, transmission projects, especially undersea and land cables, require long lead times. The NEM is also undergoing rapid and significant change. Progressing a 'shovel ready' project able to be in service from 2027 provides options to address the possibility of external factors changing in the NEM when compared to the scenarios modelled, such as delays in other renewable energy developments and transmission interconnection in mainland Australia, or the earlier retirement of coal-fired generation.⁶¹ 2027 is therefore referred to as the 'target date' from which Marinus Link and supporting transmission could start providing services to the NEM. The target date is indicated in Figure 10, together with the timing under the RIT-T scenarios modelled.



Figure 10 Timing of Marinus Link under different scenarios, including target date

While a 2027 target date does not presently optimise benefits under the RIT-T, this timing still provides net benefits to the NEM over the project's life under all scenarios modelled. Our analysis shows that, with an in-

⁶¹ In its July 2019 Insights paper, "AEMO identifies benefits in advancing some of the transmission developments identified in the 2018 Integrated System Plan [, including Marinus Link,] to increase NEM resilience by providing insurance against coal-fired generation retiring earlier than currently expected." AEMO, *Building power system resilience with pumped hydro energy storage*, p. 14.





service date of 2027 and 2028, Marinus Link and supporting transmission will provide significant benefits to the energy market in excess of the estimated cost, both capital and operating, over the study period.⁶² As Figure 11 shows, net energy market benefits range between an estimated \$600 million and potentially up to \$3.1 billion, depending on the scenario considered.⁶³



Figure 11 Net market benefits with Marinus Link and supporting transmission in service in 2027 and 2028 across Scenarios

The dynamic nature of the NEM and the significant benefits of the project reinforce the assessment that it is prudent to progress Marinus Link and supporting transmission through the Design and Approvals phase so they are able to be in service from 2027.

Government funding could bring the in-service date forward from the RIT-T assessed timing to the 2027 target date. An estimated \$150 million acceleration contribution by government would allow the RIT-T to be passed from 2027.⁶⁴ A contribution of this kind would recognise the risk mitigation value of an earlier in-service date for Marinus Link and supporting transmission.

⁶² The study period is from is 1 July 2020 to 30 June 2050. The net market benefits of Marinus Link and supporting transmission accrue from the in-service date (2027-28), through to the end of the study period (2050).

⁶³ Estimated net energy market benefits are sourced from *PADR*, Section 6.1, Table 11, and reflect an in-service date of 2027-2028.

⁶⁴ Figure sourced from *PADR*, Section 6.3.1.





4 Revenue Recovery and Pricing Reform

The preferred service model for Marinus Link and supporting transmission is a regulated service model with a modified pricing framework.

An approach is needed where those customers who benefit from a transmission investment, including through lower power bills, pay for the investment over its forecast service life.

Other funding options, such as national infrastructure funding, could also be used to manage the cost to electricity customers that will arise from the NEM's rapid transition.

Regulated model

A number of service models for earning and recovering revenue for Marinus Link and supporting transmission over the lifetime of the assets have been considered. These have included a regulated model, a market-exposed merchant model, a contract merchant model, and a hybrid model. Financial analysis performed to date indicates that the preferred service model for Marinus Link and supporting transmission is a regulated service model with a modified pricing framework. The economic analysis supports this, indicating that Marinus Link and supporting transmission will pass the RIT-T and therefore be able to earn a regulated revenue stream, including a regulated rate of return. Telecommunication services will also be provided from the optical fibre cables forming part of Marinus Link, generating unregulated revenue.

A regulated model refers to a project where costs can be recovered via regulated transmission charges incurred by electricity customers. The analysis shows that a regulated service will support lower overall delivered energy costs for end customers and, in so doing, will best capture the value Marinus Link and supporting transmission will deliver to electricity customers in the NEM.

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Revenue requirement

The regulated revenue requirement for Marinus Link and supporting transmission has been estimated based on the principles underpinning the Australian Energy Regulator's (**AER**) Post Tax Revenue Model (**PTRM**) for regulated transmission services.

Based on the assumed capital cost of \$3.5 billion, the forecast revenue requirement (in nominal terms) for the first year of operations in FY28 is approximately \$146 million, which reflects Stage One revenue requirements only. This is expected to increase to approximately \$290 million (in nominal terms) ten years later in FY37, at which time both Stage One and Stage Two are operational. The gradual growth in the revenue requirement is the result of inflation on operating expenditure and the regulated asset base (**RAB**).

Figure 12 presents the expected maximum allowed revenue for Marinus Link and supporting transmission electricity network services based on the current working assumptions for the project.



Figure 12 Expected maximum allowed revenue (MAR) for Marinus Link and supporting transmission (\$m nominal, smoothed) (until FY67)

As discussed below, it is also expected that Marinus Link and supporting transmission may be able to generate additional unregulated revenue from the commercialisation of telecommunications infrastructure.

Figure 13 presents the forecast regulated revenue for Marinus Link and supporting transmission for the first decade of operations.





Year ended 30 June	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37
Marinus Link	127	222	225	229	232	235	238	241	245	248
Supporting Transmission	20	37	37	38	38	39	40	41	41	42
Regulated revenue	146	259	263	267	270	274	278	282	286	290

Figure 13 Breakdown of expected maximum allowed revenue between Marinus Link and supporting transmission (\$m nominal, smoothed) (FY28 – FY37)

Regulated revenue is recovered from customers via regulated transmission charges. Under the current transmission pricing arrangements for regulated services in the NEM there would be a significant mismatch between those parties that pay for Marinus Link and supporting transmission through annual regulated transmission charges, and those customers who benefit from it. This reflects the current pricing Rules, which primarily allocate cost recovery to *where* an investment is located, rather than to *who* benefits from it. Therefore, for Marinus Link and supporting transmission, under a regulated service model, ongoing costs would be recovered from electricity customers in Victoria and Tasmania, but the benefits would be enjoyed by mainland NEM customers. To address this, the pricing framework needs to change.

Fair pricing outcomes

An approach is needed where those customers who benefit from a transmission investment, including through lower power bills, should fund the investment over its forecast service life. In November 2019, this issue was recognised by the COAG Energy Council, which requested the ESB to provide advice on a fair cost allocation methodology for interconnectors. TasNetworks has prepared a discussion paper to seek stakeholders' views, which will inform a submission to the ESB's anticipated consultation on this issue. An appropriate pricing outcome is required for the project to proceed. The discussion paper is included for consultation as part of the RIT-T *PADR* and can be found as Attachment 3 to the *PADR* on our website.⁶⁵ An appropriate customer pricing outcome is required for the project to proceed.⁶⁶

National infrastructure funding

In addition to changes to pricing Rules, other funding options could be used to manage the cost to electricity customers that will arise from the NEM's rapid transition.

⁶⁵ https://www.marinuslink.com.au/wp-content/uploads/2019/12/attachment-3-cost-allocation-discussion-paper.pdf

⁶⁶ For more detailed discussion of this issue, see *PADR*, Chapter 7: Who pays for the link?





The scale and pace of transmission development required in the NEM is extraordinary. Government support could offset the costs of this transition for electricity customers. In particular, national infrastructure funding could be used for transmission infrastructure, with priority given to projects identified by Infrastructure Australia and under AEMO's ISP. Funding of this kind would recognise the national benefits of infrastructure such as Marinus Link and supporting transmission. Government infrastructure contributions to underwrite the project, such as those recently announced to support timely development of the Queensland to New South Wales interconnector upgrade, can also ensure that the national benefits from Marinus Link and supporting transmission are delivered in a timely way.

A framework for national transmission infrastructure funding would reduce the risk and cost of investment that the NEM is facing, and could be structured to support appropriate end customer pricing outcomes. Schemes of this nature exist internationally, including the European Union's Projects of Common Interest framework, used to support development of interconnection across Europe.⁶⁷ Government funding contributions could help enable an efficient and interconnected national electricity transmission network that is vital to Australia's future economic prosperity and social welfare.

⁶⁷ For further information, see: https://ec.europa.eu/energy/en/topics/infrastructure/projects-common-interest.





5 Technical Feasibility

The favoured technical design is for a 1500 MW HVDC interconnector, built in two 750 MW components, supported by an upgraded AC transmission network.

The technical design provides the optimal capacity that can be integrated into the Tasmanian and Victorian power systems without causing stability issues, and efficiently unlocks Tasmania's cost-competitive hydro and wind generation, and deep pumped hydro energy storage resources for NEM benefit.

Technical design

Central to the business case for this project is the ability to provide access to Tasmania's cost-competitive hydro, pumped hydro, and wind resources, thereby increasing dispatchable capacity in the NEM. To deliver on this, the project has identified the optimal technical solution, enabling 1500 MW of capacity across the HVDC Marinus Link.

The link connects to the AC transmission network via converter stations in Tasmania and Victoria, and is supported by AC transmission network upgrades in Tasmania to enable efficient transport of energy to and from the link. In Victoria, the link will connect to the existing transmission network at the Hazelwood Substation, which has sufficient capacity to accommodate flows to and from Marinus Link.

The supporting transmission in Tasmania has been considered as part of TasNetworks' North West Tasmania Strategic Transmission Plan in order to efficiently facilitate Marinus Link connection and additional generation and pumped hydro developments forecast in the region. This includes development of resources forecast in the North West Tasmanian REZ and Central Tasmanian REZ identified by both AEMO and TasNetworks.

The favoured technical design of Marinus Link is for two symmetrical HVDC monopoles built in two 750 MW components, each using 320 kilovolt (**kV**) cables.







Figure 14 Two symmetrical HVDC monopole configuration for 1500 MW

This configuration is technically and environmentally feasible; it uses proven cable technology and allows the use of bundled cables, which minimises magnetic fields in the marine environment within close proximity to the cable. The use of 320 kV voltage also has commercial advantages, as it is produced by a number of manufacturers and is therefore expected to maximise participation in the tendering process.

The interconnector is designed as two components to help maintain power system stability. This design ensures that no more than 750 MW is lost in a credible contingency event.⁶⁸ This means that the power system will remain in a satisfactory operating state if there is a fault in Tasmania, in Bass Strait, or in Victoria that affects the operation of Marinus Link.⁶⁹ A 750 MW credible contingency level has been reviewed by AEMO and is considered reasonable. Based on the economic analysis, the optimal capacity is 1500 MW built in two 750 MW links to manage the credible contingency level.

The HVDC cabling will consist of:

- Approximately 90 km of underground cabling on the Victorian side;
- Approximately 250 km of submarine cabling across Bass Strait; and

⁶⁸ Credible contingency events are events considered to be reasonably possible to occur. Typically, a credible contingency event involves the unplanned tripping of any single item of network or generation equipment.

⁶⁹ A satisfactory operating state is one where key power system parameters such as voltage and frequency remain within prescribed limits.





• Up to 5 km of underground cabling on the Tasmanian side.

The HVDC cable connects into the AC transmission networks in Tasmania and Victoria. Converter stations using voltage source converter (**VSC**) technology will manage the interface between the AC transmission network and HVDC at both ends of Marinus Link.⁷⁰



Figure 15 Schematic representation of Marinus Link

Proven technology

There are two ways to transfer electricity in a power system: via high voltage AC (**HVAC**) or HVDC. Higher voltages are used in both instances to reduce system losses. Power systems are generally alternating current (**AC**) due to its relative ease of voltage transformation and lower cost connections compared with direct current (**DC**).

Marinus Link would include approximately 350 km of undersea and underground cable that crosses Bass Strait and connects into converter stations in Tasmania and Victoria. Over long distances, HVDC cables are more efficient than HVAC cables and, unlike with HVAC cables, there is no need to regulate voltage along HVDC cables. Therefore, the only feasible option for Marinus Link is a HVDC interconnector.

Converters transform electricity between the HVDC of the interconnector and the HVAC power systems at each end. There are two main HVDC converter technologies available in the market. These are the Line Commutated Converter (**LCC**) and the VSC.

LCC technology, commonly known as HVDC Classic, has been used in subsea interconnectors and longdistance high-power transmission for more than 50 years. It is the technology used on Basslink.

VSC is a newer technology that is increasingly prevalent in interconnectors, both existing and in development, around the world. This is because of VSC technology's better technical performance and greater operational flexibility when compared with LCC technology.

⁷⁰ A fuller description of the technical options considered for Marinus Link and supporting transmission is available in the *Project Marinus Initial Feasibility Report*, Chapter 3.

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VSC is the proposed HVDC converter technology for Marinus Link due to its ability to:

- Operate with lower system strength in Tasmania and a broader NEM future power system with increased inverter-connected renewable generation and less synchronous generation;
- Support seamless power flow during power flow reversals;
- Support continuous provision of frequency control ancillary services;
- Provide substantial reactive power support under alternating current system contingencies; and
- Offer black start capability (the ability to restart the power system after a blackout event).

Supporting transmission

The technical design includes approximately 220 km of supporting transmission augmentations in Tasmania. These augmentations include new substations in the Burnie and Staverton areas and strengthened transmission corridors in North West Tasmania through to Palmerston, south of Cressy (see Figure 16). The augmentation requirements have been determined in conjunction with TasNetworks' North West Tasmania Strategic Transmission Plan.

This plan includes technical studies that identify the optimal transmission configuration to support Marinus Link and provide best access to the Tasmanian REZs, as well as ensuring the necessary system stability and security requirements for a 1500 MW link are met. There is potential for some aspects of the supporting transmission for Marinus Link to be accelerated to meet earlier connection requirements for customers. Any such acceleration costs would be funded directly by those customers as unregulated transmission services.







Figure 16 Indicative map of Marinus Link with supporting transmission⁷¹

Upgrades to the existing AC transmission network in Victoria will not be required. This is because the proposed route connects to the existing AC transmission network at Hazelwood Substation in the Latrobe Valley, where

⁷¹ Further detail on the favoured route will be released in early 2020 once the relevant landowner engagement has been undertaken.





there are no REZs identified by AEMO and where there is sufficient connection capacity in the AC transmission network following the closure of the Hazelwood power station.

Consideration of other related developments

A range of potential developments has been considered in determining the technical design. For example, TasNetworks has engaged with proponents of the Star of the South offshore wind farm, planned on the eastern side of Wilson's Promontory in Victoria.⁷² The proposal is for 2000 MW of new offshore wind capacity. TasNetworks and Star of the South have considered potential synergies between the two projects. While there is potential to co-locate some assets (for example, converter stations), the main route corridors for both projects may be separate.

TasNetworks continues to engage with AEMO as jurisdictional planner for Victoria, and with Star of the South and other major project developers across the NEM, to help inform the technical design and optimise the benefits of Marinus Link and supporting transmission.

Power system integration

The technical feasibility of Marinus Link and supporting transmission have been considered with respect to the interconnector's design and how it will integrate with the existing power system. This work has built on the technical studies undertaken for the *Initial Feasibility Report* and has taken into account integration with the existing Basslink interconnector, the Tasmanian and Victorian power systems, and new generation and load profiles forecast in the NEM.

Steady state studies have been undertaken to examine how the power system would respond to Marinus Link and supporting transmission in operation under normal conditions. Dynamic studies have also been undertaken to identify what the power system requirements would be in a contingency event with Marinus Link and supporting transmission in operation, and / or what constraints or limits would need to be imposed on Marinus Link and supporting transmission in order to maintain system security.⁷³

The findings from these studies indicate that Marinus Link can have a nominal capacity rating of 1500 MW, delivered via two 750 MW components. As noted above, this configuration ensures that a credible contingency event could be managed.

The power system integration studies also indicate that, if or when required, the nominal capacity rating of 1500 MW will be constrained to a lower level to ensure Marinus Link meets system frequency requirements. Furthermore, Marinus Link's import capacity will be influenced by the timing of wind generation and pumped

⁷² For further information, see: <u>http://www.starofthesouth.com.au/</u>

⁷³ Contingency events refer to any failures within the system (such as generator or transmission line tripping or a sudden reduction in load).





hydro generation and storage developments in Tasmania. The fault ride through performance of various generator sources (such as wind, solar, and pumped hydro) will also influence Marinus Link's import capacity. These power transfer constraints have been included in the market model.

With Marinus Link and supporting transmission in operation, all renewable generators in Tasmania will also need to be able to operate above 53 Hz for a short period of time to ensure the Tasmanian power system is able to cope with non-credible contingency events, similar to those that contributed to South Australia's system black.⁷⁴ This operating level is within the range authorised by the National Electricity Rules, and will serve as a backup scheme to protect the power system.

A range of technical issues will continue to be worked through as the requirements of the NEM evolve to ensure successful technical operation of Marinus Link and a secure and reliable power system. Further technical analysis will also consider the potential impact of future climate and environmental changes.

Telecommunications

Optical fibre cables will be installed in each of the 750 MW components of Marinus Link. Some of the optical fibre capacity will support Marinus Link's performance, including monitoring and control of the HVDC cable, while the remaining capacity will be commercialised and generate an unregulated revenue stream. The additional optical fibre provided by Marinus Link and supporting transmission will double the optical fibre telecommunications cable routes across Bass Strait and support greater telecommunications capacity, competition, and security between Tasmania and mainland Australia.

⁷⁴ Non-credible contingency events are contingency events other than credible contingency events. These are generally considered to be events that are rare in occurrence, in particular multiple credible contingency events occurring at the same time.





6 Route Selection and Approvals Process

A route has been identified that has sought to minimise local impact on communities and the environment whilst balancing key objectives of cost efficiency and constructability.

To date, work undertaken for the environmental, planning, and cultural heritage approvals indicate that the selected route for Marinus Link and supporting transmission is feasible.

A credible and achievable environment and planning approvals timeframe has been identified, which places approvals on the critical path to reaching FID.

The favoured route

The favoured route connects the Latrobe Valley in Victoria, through to Burnie in North West Tasmania using HVDC technology, with AC transmission network upgrades in North West Tasmania through to Palmerston Substation, south of Cressy.

Route selection process

The benefits that Marinus Link and supporting transmission will provide to the NEM need to be in careful balance with community, customer, and environmental concerns. The route selection process has sought to minimise local impact on communities and the environment whilst balancing key objectives of cost efficiency and constructability. The project is engaging with landowners prior to publicly releasing the route. The finalised route design will consider and address feedback received through landholder and community engagement activities.

The route selection has involved a process of elimination that balanced the benefits, constraints, and opportunities of each option. The process was thorough, involving a team of experts in fields of land-use planning, power system engineering, economics, environment, cultural heritage, and the law, who were engaged over the course of twelve months to inform the selection. Key considerations included:

• Power system integration to ensure capacity can be accommodated and system stability and security remains;





- Proximity to where the energy would be consumed (load), and where the energy will be generated or stored, including REZs; and
- Constraints, including high value ecological areas, agriculture and urban development.

Overhead and underground considerations

The appropriate use of HVDC and HVAC in overhead and underground options has been considered for Marinus Link on the Victorian and Tasmanian sides, and for the supporting transmission required in North West Tasmania. The decision to adopt HVDC or HVAC, and overhead transmission lines or underground cables, takes into account technical, environmental, social, and economic issues. While placing transmission assets underground can be more visually appealing, it generally has materially higher construction costs, particularly for HVAC assets. HVAC is more flexible in accommodating new connection points than HVDC, which requires expensive converter technology.

As discussed above, undersea HVDC cable is the only viable option for the long Bass Strait crossing. In Victoria, for the land component, the recommended approach is for approximately 90 km of underground HVDC cabling from the landing site in Victoria to a converter station in the Latrobe Valley. It is feasible to use only HVDC on the Victorian side as there is no REZ in the region and no additional connection points forecast. The overall cost of installing this length of HVDC cabling underground will be less than if this section of Marinus Link were installed overhead as HVDC. This is because overhead DC requires more costly converters to meet power system stability requirements, such as managing lightning induced faults, which are not necessary for underground DC cabling. The option to install the DC line underground in parts and overhead in parts was also explored; however, this split approach would cost more than installing the HVDC line underground in its entirety.

Similarly, in Tasmania, the recommended approach is for up to 5 km of underground HVDC cabling from two potential landing sites on either side of Burnie to the converter stations. Alternating current is proposed for the supporting transmission in Tasmania, consistent with the existing transmission network. This proposal also supports cost-effective connection opportunities for renewable generation and storage developments in the region.

For the approximately 220 km of supporting AC transmission upgrade required on the Tasmanian side, the recommended approach is for overhead AC transmission lines. Overhead AC transmission will achieve the required transmission capability at an appropriate cost and presents opportunities for line design to address biodiversity, cultural heritage, terrain, and some land use constraints. Having overhead transmission lines will also provide increased flexibility in addressing issues associated with the rugged terrain and landslip prone areas in the proposed transmission line corridors.

Work has commenced to secure access to land and easement rights for both the preferred route corridor and to preserve corridors for possible further Bass Strait interconnection in the future.

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Approvals process

Marinus Link would cross Tasmanian, Victorian, and Australian Government jurisdictions. The project is subject to a large and complex multi-jurisdictional approvals process, including, planning, environmental, and cultural heritage approvals. The approvals pathway seeks to:

- Apply the level of assessment appropriate for a project of this nature;
- Include transparent stakeholder engagement;
- Satisfy the legislative requirements of all three jurisdictions; and
- Facilitate efficient and timely assessment of the project.

Detailed desktop studies, together with baseline flora and fauna field surveys undertaken to date, have not identified any material issues in the HVDC route option or supporting transmission. More detailed site investigations will include surveys of land and marine environments, refining easement alignments and geotechnical and geomorphological assessments of shore crossings. Funding from the Australian Government is supporting this early Design and Approvals work.

Marinus Link and the supporting transmission will be subject to Australian Government assessment under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) (**EPBC Act**), while, at a State level, comprehensive assessment and approvals processes will cover land-use planning, cultural heritage, and environmental matters. Engagement with Traditional Owners and Aboriginal Corporations has begun. The project is also working with relevant authorities to identify likely and appropriate pathways to comply with Native Title and to begin developing relationships with Aboriginal communities around cultural heritage considerations and project participation.

Given the multi-jurisdictional nature of the project, and in order to facilitate a coordinated and robust assessment and approvals process, the project is working with the Tasmanian, Victorian, and Australian Governments, with the goal of aligning assessment processes where possible.

A credible approvals pathway for each of Marinus Link and supporting transmission has been identified and the associated approvals timeframes identified. The forecast timeline places the land-use, environment, and cultural heritage approvals on the critical path to reaching FID for the HVDC transmission link and associated AC transmission investment. International experience suggests that achieving such approvals and permits are commonly on the critical path to achieving FID for interconnector projects.





7 Stakeholder and Community Engagement

Stakeholder and community engagement for the project aims to educate and raise awareness of Marinus Link and supporting transmission, while providing multiple opportunities to provide feedback and make informed submissions relating to the project.

The project continues to raise awareness and understanding of Marinus Link and supporting transmission and their impacts, and follows best practice engagement principles. Engagement activities include informing and, where possible, consulting on preliminary route options, environmental and cultural matters, pricing challenges, economic benefits and costs, and the business case assessment process.

Robust consideration of social and environmental impacts across a range of dimensions and careful community consultation are critical to the success of Marinus Link and supporting transmission. As for any large-scale development, there will be a level of trade-off required between local impacts and delivering a project that has positive outcomes for energy customers, communities, and the environment. A range of stakeholders, interest groups, and individuals have been engaged with across the NEM in order to raise awareness and understanding of Marinus Link and supporting transmission and its potential impacts, including route, environmental and cultural matters, pricing challenges, economic benefits and costs, and the business case assessment process. The project continues this engagement, promoting opportunities for stakeholders to provide feedback and comment, and outlining how this feedback will considered.⁷⁵

Informed by best practice principles

The project has developed a comprehensive stakeholder and community engagement plan. The engagement activities are informed by the International Association for Public Participation (IAP2) spectrum for public participation. Activities to date have focused on understanding stakeholder context, informing and – where possible – consulting with key stakeholders, interest groups and individuals about the project. A list of

⁷⁵ As with any large and complex infrastructure project, there exist non-negotiable elements, relating to safety, technical, economic, environmental and/or financial limitations.





forthcoming engagement activities is available here – <u>https://engage.marinuslink.com.au/engagement-timeline</u> – and includes the knowledge sharing undertaken in accordance with our agreement with ARENA.

Community engagement for the project aims to educate stakeholders and raise awareness of Marinus Link and supporting transmission, while providing multiple opportunities for stakeholders to provide feedback and make informed submissions relating to the project. Listening and being open to issues and concerns is paramount. Ongoing monitoring and reporting on engagement activities is used to optimise the effectiveness and relevance of these activities. This also assists in monitoring community sentiment towards the project.

The project is committed to communicating in a transparent, respectful, and timely manner with the broad range of stakeholders relevant to Marinus Link and the supporting transmission. These stakeholders include governments, energy sector participants and developers, regulators, peak bodies, community members, customer groups, traditional owners, and landowners.

Stakeholder and community engagement is ongoing

Engagement with stakeholders and the community will continue to promote an understanding of the project and the critical role it can play in the future NEM. As the Marinus Link and supporting transmission project progress through the Design and Approvals phase, resourcing will increase to further engage with community and stakeholders in Tasmania and Victoria, and at a broader national level.

Through formal channels, such as the release of the *PADR*, and informal channels, such as community popup centres and surveys, the project will promote opportunities for stakeholders and the community to provide information and feedback on the project. Engagement will continue to ensure the environmental, economic, cultural and social impacts of Marinus Link and supporting transmission are carefully considered, that communities are engaged, and that the range of impacts from it are understood, including positive benefits that will arise from Marinus Link and supporting transmission and any negative impacts that need to be managed. The Design and Approvals process will continue this extensive program of engagement.⁷⁶

⁷⁶ Further information on engagement activities related to Marinus Link and supporting transmission is available here: <u>https://engage.marinuslink.com.au/</u>





Maximising opportunity for regional communities

Marinus Link and supporting transmission will create billions in economic growth, thousands of jobs, and be a source of skills development in Tasmania and regional Victoria. The project will generate skills and opportunities that support Australia's continuing transition to a cleaner energy sector.

The economic analysis indicates that Marinus Link and supporting transmission will generate significant direct and indirect benefits for regional communities in Tasmania and Victoria. Maximising the social, economic, and employment opportunities for regional communities that will emerge from further development of the energy sector involves cooperation across industry, government, and skills bodies. The project is working with regional communities are understood and can be realised.⁷⁷ The project will continue to work with industry, government, and skills bodies to maximise the vast social, economic, and employment opportunities that Marinus Link and supporting transmission unlocks in Tasmania and regional Victoria.

⁷⁷ Indicative of this work is the recent launch of the Cradle Coast Future Energy Hub in Burnie, a partnership between TasNetworks and the Cradle Coast Authority.





8 The Commercial and Financial Case

The work undertaken to date shows that Marinus Link and supporting transmission are commercially viable, providing net economic benefits, and generating commercial returns from providing regulated transmission services and unregulated telecommunications services.

Revenue

As outlined above, a number of service models for earning and recovering revenue for Marinus Link and supporting transmission over the lifetime of the assets have been considered. The assessment is that a regulated services model achieves the appropriate confidence required for both customers and investors; customers can be confident that the regulatory process will include appropriate 'checks and balances' to achieve efficient customer outcomes and investors can be confident that the regulatory project of this scale.⁷⁸ The revenue allowance should be structured to appropriately compensate investors for the specific risks associated with the investment and ensure fair risk sharing between investors and customers.

Once regulated, and with a modified pricing framework, there is confidence that equity and debt providers will be willing to invest in Marinus Link and receive returns consistent with the regulatory framework. Regulated electricity transmission services are generally attractive to debt and equity providers because they enjoy a revenue stream over the life of the asset that can be forecast with a reasonable degree of confidence.

Additional unregulated revenue will be earned from the telecommunications services that can be provided using the optical fibre cables forming part of Marinus Link.

⁷⁸ A regulated model would still be exposed to the regulatory process at each revenue reset period, with is typically every five to ten years.





Government underwriting for timely progression

The adoption of a regulated model requires Marinus Link and supporting transmission to pass the RIT-T process, which the economic analysis indicates will occur. It also requires the AER to determine a revenue allowance. As a number of stakeholders have identified, the present regulatory processes can take some time to demonstrate the RIT-T has passed and to determine a revenue allowance to deliver the funding certainty required to progress a long-lead time project through to FID.⁷⁹ Underwriting contributions can therefore ensure the project has sufficient funding to progress to FID in a timely way while regulated revenue arrangements are resolved. Further government infrastructure contributions to underwrite the project, such as those recently announced to support timely development of the Queensland to New South Wales interconnector upgrade, can ensure that the national benefits from Marinus Link and supporting transmission are delivered in a timely way.

Another factor affecting timely progression may be the difference in the economically optimal timing for Marinus Link as calculated under the RIT-T and the target date from which the project can be in service and provide net benefits. This could mean a potential gap between the time Marinus Link can recover regulated revenues from customers, and the earlier time it can provide economic value to the NEM and regional communities.

As noted above, government funding could bring the in-service date forward from the RIT-T assessed timing to the 2027 target date. An estimated \$150 million acceleration contribution by government would allow the RIT-T to be passed from the 2027 target date. A contribution of this kind would recognise the risk mitigation value of an earlier in-service date for Marinus Link and supporting transmission.

Ownership and funding

This project involves progressing two major and interdependent components in parallel: Marinus Link, as the HVDC component, and the supporting Tasmanian transmission development required in North West Tasmania to facilitate Marinus Link.

Supporting transmission

The Tasmanian transmission infrastructure supporting Marinus Link will form part of TasNetworks' existing shared transmission network and will ultimately be owned by TasNetworks, regardless of the ownership model adopted for Marinus Link. Some elements of the North West supporting transmission may initially be built to provide connection with new electricity generators as required, potentially as unregulated services. With a successful RIT-T and revenue allowance by the AER, these assets will transition to regulated services with regulated pricing arrangements.

⁷⁹ This is highlighted in Recommendations 5 and 6 of the Energy Security Board's plan to make the ISP actionable. *Converting the Integrated System Plan into Action – Consultation Paper*, May 2019, pp. 17-18.





Marinus Link

Marinus Link can be successfully developed and operated under a range of ownership models. One model is public ownership, which could support the timely development of Marinus Link. A public ownership model would also take into account the interests of electricity customers, benefits to regional communities, and national infrastructure considerations.

One option is for a shared public ownership structure of Marinus Link between the Australian Government and the Tasmanian Government. The Australian and Tasmanian Governments would hold a number of shared objectives for Marinus Link that lie beyond commercial consideration, including:

- Increasing the resilience of the NEM and supporting power systems;
- Unlocking Tasmanian renewable energy, deep storage resources, and dispatchable generation capacity for the benefit of the NEM;
- Placing downward pressure on prices throughout the NEM whilst still providing a fair pricing outcome for customers in Tasmania and Victoria; and
- Supporting economic stimulus and jobs growth in Tasmania and Victoria.

An investment by government/s would recognise the national benefits to be provided by the project. Government support would also increase confidence to suppliers in a competitive international equipment market. Once the project is established and risks appropriately managed, government owners would have the option to consider their ownership position.

Private investment in Marinus Link could also be considered throughout the project's lifecycle, subject to meeting broader policy objectives. Ownership decisions for Marinus Link will be a matter for government.

Procurement strategy

Procurement for a project of this scale involves progressing through three key stages:

- Strategy and planning;
- Sourcing and contract award; and
- Management of the awarded contracts.

The procurement strategy is on track to be finalised in 2020 and includes measures to address the project's approach for managing financial risk, packaging of work scope, contracting, and commercial models. This strategy will also inform how the Requests for Tender are prepared.

At present, the procurement strategy assumes that supporting transmission will be sourced and procured by TasNetworks under existing equipment and service provider procurement frameworks. The need to manage

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the scale of the supporting transmission developments and the number of other large infrastructure projects nationally will be considered as part of the strategy.

Obtaining the primary equipment for Marinus Link (i.e. HVDC cables and converters) will involve dealing with an international and specialised supplier market, which is experiencing a surge in demand from a number of projects worldwide. Procurement of these components will consider procurement risks, streamlining of procurement processes and supplier interactions, and timely delivery considerations.

On projects of this nature, single or multiple Engineering, Procurement, Construction (**EPC**) contracting models are possible. The market analysis suggests that Marinus Link may need to be delivered via one EPC contract package for cable equipment and installation and another EPC contract package for converter equipment and installation. This is the predominant contracting approach taken on HVDC interconnector projects worldwide.

In addition to the supply and installation of specialist HVDC equipment, there will be a requirement for a skilled workforce, also competing for resources in projects within Australia and worldwide. Investment certainty, with a project that is considered credible, will secure the workforce, equipment, and services required to deliver Marinus Link and supporting transmission on time and at an appropriate cost.

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9 Governance and Project Delivery

Governance

TasNetworks is the proponent of Marinus Link and supporting transmission, on behalf of its shareholding Ministers, the Tasmanian Treasurer and Minister for Energy. Marinus Link Pty Ltd is a wholly owned special purpose subsidiary, established within the TasNetworks group to hold any intellectual property or assets acquired in progressing the feasibility and business case assessment of Marinus Link, the HVDC interconnector component.

TasNetworks, as a State-owned company, is established under the *Electricity Companies Act 1997* (Tas) and is incorporated under the *Corporations Act 2001* (Cth). The Tasmanian Government sets out its broad policy expectations and requirements for the company in an instrument issued by the Treasurer and Minister for Energy, titled the Members' Statement of Expectations. The company also operates in accordance with Treasurer's Instructions and Government Guidelines.

TasNetworks' Board Charter provides the framework for TasNetworks' corporate governance structure and practices. The Charter describes the responsibilities of the TasNetworks Board of Directors and the TasNetworks Leadership Team.

TasNetworks' Board Charter is based on the Australian Stock Exchange Corporate Governance Council's Corporate Governance Principles and Recommendations, as adjusted to apply to an unlisted, State-owned company in line with the Tasmanian Government Business Corporate Governance Principles.

The Australian Government has provided funding to support Marinus Link and supporting transmission, via a \$56 million grant to the Tasmanian Government. The grant agreement includes a range of deliverables and anticipated timeframes.

The ownership structure of Marinus Link and supporting transmission throughout the phases of the project is likely to have a strong bearing on the ongoing governance structure and requirements. Notably, the two project elements – the HVDC transmission link and the supporting AC transmission network – are interdependent, with both required to realise the overall business case. To ensure the objectives of the project as a whole are achieved, there will need to be a high level of cooperation and a commercial framework that recognises this interdependency. This framework will need further strengthening if there are different owners of the two project elements. In particular, the framework must ensure that the HVDC transmission link and the supporting AC transmission network are ready for FID before moving to manufacturing and construction.⁸⁰

⁸⁰ Some elements of the supporting transmission in North West Tasmania may initially be built to provide connection services for new electricity generators. With a successful RIT-T and revenue allowance by the AER these assets will transition to regulated services with regulated pricing arrangements.





The shareholders of Marinus Link and TasNetworks will make the final investment decision on the recommendation of the relevant Board(s).

Energy market governance

Marinus Link and supporting transmission are proposed to provide regulated transmission services. As such, they will be subject to a range of obligations under the NEM and a range of national and state legal frameworks that set out obligations as a transmission network service provider (**TNSP**) in Tasmania and Victoria.

At a national level, the AER is responsible for the economic regulation of electricity transmission services in accordance with the National Electricity Law (**NEL**) and the National Electricity Rules. The AER's economic regulation functions and powers include:

- Determination of allowed revenues for a regulatory period;
- Design and application of various schemes to simulate competitive forces and provision of incentives to pursue efficiency gains in operating and capital expenditure and to maintain service standards; and
- Approval of the transmission pricing methodology to be applied for a regulatory period, in accordance with Rules requirements.

In Tasmania, the Office of the Tasmanian Economic Regulator (**OTTER**) also has regulatory responsibilities relevant to transmission services. OTTER publishes and maintains the Tasmanian Electricity Code (**the Code**). The Code sets out the detailed arrangements for the regulation of the Tasmanian electricity supply industry and is enforceable under the *Electricity Supply Industry Act 1995* (Tas), the principal Act governing the operation of the electricity supply industry in Tasmania.

In Victoria, the *Essential Services Commission Act 2001* (Vic), the *Electricity Industry Act 2000* (Vic), the Energy Retail Code, and the Electricity Distribution Code, regulate the provision of transmission services. TNSPs must apply for an electricity licence and have a demonstrable understanding of this regulatory framework before they can operate within Victoria. In addition, TNSPs must apply to AEMO before they can connect to the transmission network in Victoria (known as the Declared Shared Network). A process is underway for the project to meet these requirements on time.

Project governance structure

Within TasNetworks, Project Marinus has been established as a separate business group under the General Manager Project Marinus, reporting to the TasNetworks Chief Executive Officer. The project reports to a Steering Committee that makes strategic decisions on the project in accordance with TasNetworks' governance frameworks and makes recommendations to the TasNetworks Board. For the Feasibility and Business Case Assessment Phase, representatives from ARENA have been observers on the Steering Committee. The project governance structure will continue to evolve with the size and scope of the project.





Risk management

The project uses a thorough evaluation process to identify, manage, and mitigate risk as much as is prudent to support project outcomes. A confidential Risk Management Plan forms part of the project management framework for Marinus Link and supporting transmission. This is accompanied by a suite of supporting plans, processes and project registers, controls, and techniques used to effectively and efficiently manage the project.

Key risks that could potentially affect the project's scope, timeline, cost, resourcing, quality or deliverables include:

- Unreasonable customer pricing impacts;
- Technical and engineering issues;
- Environmental or land use planning issues;
- Negative public perception and loss of social licence;
- Resource availability issues;
- Financing and contractual risks; and
- Safety and wellbeing issues.

These risks have been evaluated according to their potential consequence on the project and their likelihood to occur, in conjunction with identifying existing controls in place, and required treatments and / or contingency plans to mitigate their impact. The Project Marinus Management team monitors the effectiveness of these controls and tracks how the level of each risk changes over time. Periodic reporting is prepared for the Steering Committee and TasNetworks Board.

Quality assurance and control

There are measures in place to ensure quality assurance and control for the project. These include independent assessment of key project deliverables and engaging independent review partners to conduct regular project health checks and objectively assess project progress and viability. These assessments will contribute to stage gate decisions throughout the project. Reviews are proposed for each stage gate.

Project delivery

Projects of this size and scale require a considerable investment of time and resources for successful delivery. A Marinus Link and supporting transmission delivery and governance framework for the Design and Approvals phase is on track to be in place by early 2020. This will include a detailed Project Management Plan and measures to ensure that the project is well resourced and makes robust decisions through delivery plans and stage gates.





Marinus Link and supporting transmission are targeted to be in service from 2027. The Project Timeline (Figure 17) includes a series of stage gates and critical decision points, including decisions about ultimate timing and staging arrangements.

There are four main stage gates to review and assess the project's viability and readiness to progress. These stage gates will be supported by an independent reviewer to advise the TasNetworks Board. The following major decision gates are proposed:

- Design and Approvals Readiness Gate;
- Selection and Design Gate;
- Final Investment Decision; and
- Commercial Operation.

JAN 2019 Public release Initial Feasibility Report	DEC 2019 Public release Business Case Assessment		2023 Final Investment Decision		2027 750 MW First Stage	2028 750 MW Second Stage
1	Î		Î		1	0

Feasibility and Busines Case Assessment	55					
Preparation	Desig	n and Approvals				
		Preparation		Manufacturing and Construction 750 MW - Stage I		In Service
			Preparation	Manufacturing and Construction 750 MW	- Stage 2	
		- 3-4 YEARS	> • • <	~ 4 YEARS	e <	
Environment and Pl	anning Approvals		- 74°			
Lodge Environment Planning Refer	t and rrals	Environment and Planning Approvals Reached				
Economic Regulato	r Approvals					
RIT-T Process	AER Review					
Decision Gates	4	4	4			
Design and Approv Readiness G	als Selection of Design G	and Final Investment ate Decision	\diamond		Commercial Operation	

Figure 17 Target date indicative timeline





10 Next Steps and Conclusion

Next steps

TasNetworks, supported by the Tasmanian and Australian Governments, is progressing Marinus Link and supporting transmission. Next steps include:

- Concluding the RIT-T process, including by working with AEMO on the 2019-20 ISP analysis;
- Building the capacity and capability of the project's resources to successfully deliver the Design and Approvals phase;
- Continuing funded critical path Design and Approvals activities, such as landowner engagement and environmental and planning assessments;
- Ongoing stakeholder and community engagement in Tasmania, Victoria, and nationally;
- Working with the Tasmanian and Australian Governments to secure funding and agree on an ownership model for Marinus Link; and
- Engaging with customer and industry bodies, rule makers, and regulators to explore a new cost allocation methodology for interconnectors to ensure fair pricing outcomes across the NEM.

A positive business case

The Business Case Assessment shows that Marinus Link and supporting transmission provide greater benefits than costs under all modelled scenarios. The analysis shows that Marinus Link and supporting transmission will support Australia's transition to a low emissions future by delivering the low cost, reliable, and clean energy that customers expect.

Work continues to progress Marinus Link and supporting transmission to being a 'shovel ready' national infrastructure project, able to be in service from 2027.

TasNetworks thanks ARENA and the Tasmanian Government for the financial contributions that enabled this Business Case Assessment to be completed in a comprehensive and timely way.





11 Glossary and References

11.1 Glossary of terms

Terms	Description
Ancillary services	Ancillary services perform the essential role of ensuring a continuously stable power system operation, especially when subjected to unforeseen contingency events. Examples include a device which can rapidly alter the network voltage to correct for voltage disturbances (caused, for example, by a lightning strike), or the ability of a generator to rapidly change its power output in response to a sudden change in customer demand. Ancillary services are defined in the Rules as 'market ancillary services' and 'non-market ancillary services'. See chapter 10 of the Rules for more detail.
Battery of the Nation	An initiative by Hydro Tasmania, supported by funding from ARENA, investigating and developing a pathway of future development opportunities for Tasmania to make a greater contribution to the NEM.
Business Case Assessment	Project Marinus assessment outlined in this document, undertaken as part of Feasibility and Business Case Assessment for Marinus Link and supporting transmission.
Contingency event	An event affecting the power system which AEMO expects would be likely to involve the failure or removal from operational service of one or more generating units and/or transmission elements (Rules clause 4.2.3(a)) e.g. lightning striking a transmission line, a sudden unexpected generator failure, bushfire smoke causing a short-circuit between transmission circuits.
Credible	Reasonably possible in the surrounding circumstances.
Credible contingency event	A contingency event that is considered to be reasonably possible to occur. Generally, a credible contingency event involves the unplanned tripping of any single item of network or generation equipment. e.g. loss of a single generator, load or circuit in the network, although in particular circumstances this definition can be extended to include several items of equipment. e.g. loss of multiple circuits in a transmission corridor in the presence of a severe bushfire. The technical definition of a credible contingency event can be found in clause 4.2.3(b) of the Rules.
Non-credible contingency event	Non-credible contingency events are contingency events other than credible contingency events. These are generally considered to be events that are rare in occurrence, in particular multiple credible contingency events occurring at the same time. e.g. coincident loss of multiple generators; loss of multiple transmission circuits without the presence of adverse weather conditions. The technical definition of a credible contingency event can be found in clause 4.2.3(e) of the Rules.
Dispatchable on-demand	A generator, such as a hydroelectric, gas- or coal-fuelled generator, in which the electrical output can be increased or decreased as required in order to meet varying customer demand. This contrasts with non- dispatchable generators, such as solar and wind, the output of which will fluctuate depending on the input power source. e.g., how strongly the wind is blowing or the sun is shining.





Terms	Description
Energy security	Refers to the certainty of being able to supply customers' energy needs in the medium and long term.
Final Investment Decision (FID)	Relates to the stage in a project where everything is in place to execute the project (contracts can be signed). Getting to this stage involves arranging all financing, permits, approvals and any other requirements that are needed prior to construction starting. It is the point where contracts for all major equipment can be placed, allowing procurement and construction to proceed and engineering to be completed.
Firming	Firming, in relation to variable generation sources such as solar or wind, is the action of adding additional power from a separate dispatchable on- demand source that can compensate for the potential lack of output from a variable generator when the power is needed.
Hybrid Model	(In reference to a service model for an interconnector) An arrangement that allows for recovery of the cost to construct and operate the interconnector via a combination of Merchant and Regulated models.
Integrated System Plan (ISP)	A plan prepared by AEMO that forecasts the overall transmission system requirements for the NEM over the next 20 years.
Likely	Greater than 50% probability of occurrence.
Marinus Link	A proposed second transmission interconnector linking Tasmania and Victoria
Merchant model (also referred to as 'unregulated')	(In reference to a service model for an interconnector) An arrangement that allows for recovery of the cost to construct and operate the interconnector via trading between regional electricity markets and/or via service agreements with counterparties.
On-demand	Available when requested or required.
Project Assessment Draft Report	The second step in the RIT-T process.
Project Marinus	The project established by TasNetworks, with funding support from ARENA and the Tasmanian Government, to complete a detailed Feasibility and Business Case Assessment of a second Bass Strait interconnector, known as Marinus Link.
Regulated Model	(In reference to a service model for an interconnector) An arrangement that allows for recovery of the cost to construct and operate an interconnector by including the costs of the interconnector in regulated transmission charges paid by electricity customers.
Regulatory Test for Transmission (RIT-T)	The RIT-T is a cost benefit analysis of all major network investments in the NEM. It assesses the need, economic and technical impact of, and preferred timing for, a network investment. Projects can only pass the RIT-T and then be built as a regulated asset if the overall energy market benefits they provide outweigh the costs of investment.
Reliability	Maintaining sufficient capacity (generation, network, and demand response) to meet customer power demands in the short-term.
Revenue allowance	The annual revenue that a TNSP is allowed, by the AER, to recover for its regulated services.

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Terms	Description
	The Rules define the revenue allowance as the 'aggregate annual revenue requirement'. The detailed definition is set out in clause 6A.22.1 of the Rules.
Rules	The National Electricity Rules (NER)
Power system security	Operation of the power system within its technical limits (for frequency, voltage, etc.) such that it will maintain stable operation including after a contingency event.
Service model	(In reference to Marinus Link) The financial model for recovery of the costs of providing Marinus Link services.
Shovel ready	A project for which approvals have been obtained and major design work is complete, allowing construction to start relatively quickly when required and funded.
System strength	A measure of the stability of a power system under all reasonably possible operating conditions.
Upgrade	(In relation to a transmission network) Works to enlarge the transmission network or increase its capacity to transmit electricity, also known as augmentation (augmentation is defined in the National Electricity Law).
Variable renewable generation	The forms of electricity generation that depend on a primary energy source that varies with time and cannot be stored. Solar and wind generation are the most common forms of variable renewable generation.





11.2 Glossary of acronyms

Terms	Description
AC	alternating current
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ARENA	Australian Renewable Energy Agency
CO2	carbon dioxide
COAG	Council of Australian Governments
DC	direct current
"Deep" pumped hydro energy storage	Long-duration pumped hydro energy storage
DER	distributed energy resources
EPC	Engineering, Procurement, Construction
ESB	Energy Security Board
FID	Final Investment Decision
GW	gigawatts
HVAC	high voltage alternating current
HVDC	high voltage direct current
IAP2	International Association for Public Participation
ISP	Integrated System Plan
kV	kilovolt
LCC	line commutated converter
MAR	Maximum allowed revenue
MW	megawatts
NEL	National Electricity Law
NEM	National Electricity Market

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Terms	Description
NER	National Electricity Rules
OTTER	Office of the Tasmanian Economic Regulator
PADR	Project Assessment Draft Report
PTRM	Post Tax Revenue Model
RAB	regulated asset base
REZ	Renewable Energy Zone
RIT-T	regulatory investment test for transmission
the market model	the "Time Sequential Integrated Resource Planner"
TNSP	transmission network service provider
UNGI	Underwriting New Generation Investment
VSC	voltage source converter





11.3 Reference documents

Author	Reference	Source
AEMO	Building Power System Resilience with Pumped Hydro Energy Storage, July 2019	https://www.aemo.com.au/- /media/Files/Electricity/NEM/Planning_and_Forecastin g/ISP/2019/ISP-InsightsBuilding-power-system- resilience-with-pumped-hydro-energy-storage.pdf
AEMO	Generation Information webpage, June 2019	https://www.aemo.com.au/Electricity/National- Electricity-Market-NEM/Planning-and- forecasting/Generation-information
AEMO	<i>Integrated System Plan</i> , July 2018	https://www.aemo.com.au/Electricity/National- Electricity-Market-NEM/Planning-and- forecasting/Integrated-System-Plan/2018-Integrated- System-Plan
AEMO	2018 ISP Appendices, 2018	https://www.aemo.com.au/- /media/Files/Electricity/NEM/Planning_and_Forecastin g/ISP/2018/ISP-Appendices_final.pdf
AEMO	2019 Input and Assumptions Workbook, Version 1.0, released on 5 February 2019	https://www.aemo.com.au/- /media/Files/Electricity/NEM/Planning_and_Forecastin g/Inputs-Assumptions-Methodologies/2019/2019- Input-and-Assumptions-workbook-v1-Feb.xlsx
AEMO	2019 Planning and Forecasting Consultation Paper, February 2019	https://www.aemo.com.au/- /media/Files/Electricity/NEM/Planning_and_Forecastin g/Inputs-Assumptions-Methodologies/2019/2019- Planning-and-Forecasting-Consultation-Paper.pdf
Aurora Energy Research	Analysis of AEMO's ISP Part 2: Economics of Coal Closure, May 2019	https://www.aemo.com.au/- /media/Files/Electricity/NEM/Planning_and_Forecastin g/ISP/2019/20190526-AEMO-Phase-2-report- summary.pdf
Aurora Energy Research	Analysis of AEMO's ISP Part 1: Benefits of Interconnection, May 2019	https://www.aemo.com.au/- /media/Files/Electricity/NEM/Planning and Forecastin g/ISP/2019/20190526-AEMO-Phase-1-report- summary.pdf

PROJECT



Author	Reference	Source
Bagshaw, E	"RBA governor says infrastructure spending should be run like monetary policy", <i>Sydney Morning Herald,</i> 24 June 2019	https://www.smh.com.au/politics/federal/rba-governor- says-infrastructure-spending-should-be-run-like- monetary-policy-20190624-p520qq.html
CSIRO	Australian National Outlook 2019	https://www.csiro.au/en/Showcase/ANO
Energy Security Board	Converting the Integrated System Plan into Action – Consultation Paper, May 2019	http://www.coagenergycouncil.gov.au/sites/prod.energ ycouncil/files/publications/documents/ESB%20- %20Converting%20the%20ISP%20into%20Action%2 0-%2020190517.pdf
Ernst & Young	The Economic Contribution of Marinus Link and Supporting Transmission, November 2019	https://www.marinuslink.com.au/wp- content/uploads/2019/12/the-economic-contribution- of-marinus-link-and-supporting-transmission.pdf
Ernst & Young	Project Marinus PADR Market Modelling Report, November 2019, Attachment 1 of the Project Marinus Regulatory Investment Test for Transmission Project Assessment Draft Report, December 2019	https://www.marinuslink.com.au/wp- content/uploads/2019/12/project-marinus-padr- market-modelling-report.pdf
Hydro Tasmania	Battery of the Nation: Analysis of the future National Electricity Market, April 2018,	https://www.hydro.com.au/docs/default-source/clean- energy/battery-of-the-nation/future-state-nem- analysis-executive-summary.pdf?sfvrsn=205ce928_0
Hydro Tasmania	How Battery of the Nation Can Contribute to Victoria's Energy Needs and Objectives, August 2019	https://www.hydro.com.au/docs/default-source/clean- energy/battery-of-the-nation/how-botn-can-contribute- to-victoria-august-2019.pdf?sfvrsn=de409a28_4
Morrison, S (Prime Minister of Australia)	"Doorstop – Ulverstone Tasmania", media release 9 April 2019	https://www.pm.gov.au/media/doorstop-ulverstone- tasmania

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# PROJECT



| Author                                                                                                                  | Reference                                                                                                              | Source                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Morrison, S<br>(Prime Minister<br>of Australia)                                                                         | "Skills and Training for<br>Tasmania's Future", 9 April 2019                                                           | https://www.pm.gov.au/media/skills-and-training-<br>tasmanias-future                                                                                           |
| Morrison, S<br>(Prime Minister<br>of Australia),<br>Taylor, A<br>(Minister for<br>Energy and<br>Emissions<br>Reduction) | <sup>"</sup> Ensuring the future of reliable<br>electricity supply for NSW",<br>media release, 28 October 2019         | https://www.liberal.org.au/latest-<br>news/2019/10/28/ensuring-future-reliable-electricity-<br>supply-nsw                                                      |
| Shorten, B<br>(Leader of the<br>Opposition)                                                                             | "Labor to Deliver a Renewable<br>Future for North West<br>Tasmania", media release 2 May<br>2019                       | https://www.billshorten.com.au/labor_to_deliver_a_ren<br>ewable_future_for_north_west_tasmania_thursday_2<br>_may_2019                                         |
| TasNetworks                                                                                                             | Project Marinus Regulatory<br>Investment Test for<br>Transmission Project<br>Assessment Draft Report,<br>December 2019 | https://www.marinuslink.com.au/wp-<br>content/uploads/2019/12/rit-t-project-assessment-<br>draft-report.pdf                                                    |
| TasNetworks                                                                                                             | Project Marinus Initial Feasibility<br>Report Overview, February 2019                                                  | https://www.marinuslink.com.au/wp-<br>content/uploads/mdocs/Project%20Marnius%20-<br>%20Initial%20Feasibility%20Report%20-<br>%20Overview%20-%20Feb%202019.pdf |
| TasNetworks                                                                                                             | Project Marinus Initial Feasibility<br>Report, February 2019                                                           | https://www.marinuslink.com.au/wp-<br>content/uploads/2019/02/Initial-Feasibility-Report-<br>Project-Marinus-Feb-2019.pdf                                      |
| Wright, S                                                                                                               | "Frydenberg urges infrastructure<br>wish list from states to boost<br>economy", <i>The Age</i> , 11 October<br>2019    | https://www.theage.com.au/politics/federal/frydenberg<br>-urges-infrastructure-wishlist-from-states-to-boost-<br>economy-20191011-p52zuh.html                  |

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