Marinus Link Pty Ltd
PO Box 606 Moonah
Tasmania
Australia 7009

16 April 2024

Dr Kris Funston
Executive General Manager, Network Regulation
Australian Energy Regulator

By email

Dear Kris,

Re: Project Marinus RIT-T update

I am writing regarding the update that the joint proponents of Project Marinus, Marinus Link Pty Ltd (**MLPL**) and TasNetworks, have undertaken in relation to the Regulatory Investment Test for Transmission (**RIT-T**) Project Assessment Conclusions Report (**PACR**).

The PACR, which was published in June 2021, identified Project Marinus (Option D) as the preferred option for increasing the interconnection capacity between Tasmania and Victoria. This option is a 1500 MW HVDC interconnector, comprising two 750 MW cables, plus associated AC network upgrades. The PACR explained that the actual timing of each stage will be determined by AEMO's 2022 Integrated System Plan (**ISP**) and subsequent ISPs.

Project Marinus is expected to provide significant value to the National Electricity Market (**NEM**) by enabling the flow of electricity in both directions between Tasmania and Victoria, delivering low-cost, reliable and clean energy for customers as coal plants are retired and replaced by intermittent wind and solar generation. Furthermore, Project Marinus will provide the much needed firming capacity to support the growth in renewable generation that is essential for Australia to meet its emission reduction targets.

New information since the PACR

Since the publication of the PACR in June 2021, the rapid transformation taking place across the energy sector means that new information regarding the economic case for Project Marinus has become available as summarised below:

- In June 2022, AEMO published its 2022 ISP, which reconfirmed that Project Marinus is an actionable ISP project. Without Project Marinus, AEMO concluded that more mainland capacity would be required for the equivalent volume of energy, which would increase system costs for electricity consumers.[1]

[1] AEMO, 2022 Integrated System Plan, June 2022, page 73.

- In October 2022, the State and Federal Governments provided concessional financing under the Rewiring the Nation plan to progress Project Marinus and reduce the annual costs of the project to electricity customers by up to half.[2]
- In July 2023, AEMO published its 2023 Inputs, Assumptions and Scenarios Report (**2023 IASR**), which reflects the significant expansion in commitments by governments to net zero emissions, higher minimum rates of decarbonisation, increases in the scale and speed of electrification as well as other changes relating to market developments, such as the timing of coal plant closures, and new generation and storage projects.[3]
- In August 2023, AEMO published its 2023 Electricity Statement of Opportunities (**2023 ESOO**), which provides updated operational and economic information on the NEM over a 10-year outlook, period focusing on electricity supply reliability. The 2023 ESOO forecasts larger reliability gaps over the next 10 years compared to its 2022 ESOO and, in some cases, its 2020 ESOO.[4]
- In December 2024, AEMO published its draft 2024 ISP, which reflects its 2023 IASR and updates the timing assumptions for major transmission upgrades.[5]

In addition to these market developments, the forecast total costs of delivering Project Marinus have increased significantly since the PACR was published, primarily as a result of the unprecedented global demand for interconnector capacity in response to carbon reduction initiatives and energy security concerns. The cost increases experienced by Project Marinus are in line with other transmission projects, as highlighted by AEMO's 2023 Transmission Expansion Options Report.[6]

Our project cost estimates used in this RIT-T update are set out below ($June 2023):

- The total costs for Project Marinus are estimated to be $6,575 million, which comprises costs of $4,040 million for the first stage (which includes facilitation for stage 2), and $2,535 million for completion of the second stage.
- The NWTD component is $950 million for the first stage, and $525 million for the second stage.

MLPL and TasNetworks will continue to refine the cost estimates. This updated cost information will be provided to AEMO through the feedback loop process, in accordance with clause 5.16A.5 of the Rules. The extent of any change to the cost estimate will not be material in the context of this RIT-T update.

From a project perspective, the extent and magnitude of the changes since the publication of the PACR are not surprising, particularly given the rapid transformation that is taking place nationally and internationally. In fact, the PACR commented on the issue of uncertainty, highlighting the expectation that the input assumptions employed at that time would change:[7]

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2 Media Release, Rewiring the nation plugs in marinus link and Tasmanian jobs, October 2022.

3 AEMO, 2023 Inputs, Assumptions and Scenarios Report - Final Report, July 2023.

4 AEMO, 2023 Electricity Statement of Opportunities, August 2023, page 3.

5 AEMO, Draft 2024 ISP for the national Electricity Market, December 2023.

6 AEMO, 2023 Transmission Expansion Options Report, September 2023.

7 TasNetworks, RIT-T Project Assessment Conclusions Report, Project Marinus, June 2021, page 44.

> "It is evident from the 2020 ISP and AEMO's subsequent draft IASR that input assumptions will continue to change as new information becomes available. The RIT-T provides a robust framework for addressing uncertainty, through the application of scenario analysis and sensitivity testing."

As noted in the PACR, the RIT-T is designed to take account of uncertainty through the application of scenario analysis and sensitivity testing. In this regard, it is reasonable to expect that the preferred option identified in the PACR is likely to be reasonably robust to changing market conditions. Nevertheless, when material changes occur, it is appropriate to undertake further work to verify that the preferred option remains justified.

Material Change in Circumstances – EY engagement

The National Electricity Rules (**Rules**) address the possibility that circumstances change to such an extent that the preferred option in the PACR is no longer expected to maximise net market benefits. Specifically, the Rules require that the RIT-T must be reapplied if there has been a material change in circumstances, which in the reasonable opinion of the RIT-T proponent, means that the preferred option identified in the PACR is no longer the preferred option.[8]

To address this Rules requirement, MLPL and TasNetworks engaged EY to update its market modelling which it undertook at the time of the PACR, using the latest available data. EY was engaged to undertake this task because:

- EY undertook the market modelling underpinning our 2021 RIT-T PACR and would use the same market expansion model in its updated modelling. This ensures continuity in the modelling approach being applied to inform the assessment of whether the preferred option in the PACR remains unchanged.

- EY's market expansion model is recognised amongst industry participants as being robust and technology neutral. It examines the total integrated system costs of meeting customers' future electricity needs and assesses the benefits of the project by selecting the lowest cost combination of generation, storage, demand-side response and transmission investments. In this way, the model does not favour any type of technology or response.

- EY's modelling methodology follows the Australian Energy Regulator's (**AER**) Cost Benefit Analysis Guidelines - Guidelines to make ISP Actionable, August 2020. These guidelines explain how the RIT - T should be applied to actionable ISP projects, such as Project Marinus.

- EY's modelling is capable of being reconciled to AEMO's ISP modelling, as demonstrated in the PACR.

The scope of EY's engagement in updating the RIT-T market modelling sought to balance two competing objectives:

- To test fully whether or not the preferred option remains unchanged from the PACR; and

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[8] National Electricity Rules, clause 5.16A.4(n). Please note that the applicable Rule for Project Marinus predates the AEMC's MCC Rule change.

- To minimise the costs of conducting the RIT-T update by avoiding model runs and analysis that are unlikely to provide additional insights.

In relation to the latter point, it should be noted that EY were not asked to undertake market modelling for 600 MW and 1200 MW interconnector options (i.e., two 600 MW links) even though these options were considered in the PACR. The reasons for not conducting this analysis are:

- MLPL's engagement with prospective service providers through the tender process has confirmed the findings in the PACR that 600 MW increments of interconnector capacity is sub-optimal because the additional costs of providing 750 MW capacity is modest; and

- As a practical matter, as the early works activities including the tender process have been predicated (correctly) on 750 MW increments of capacity, amending these plans for 600 MW increments would expose customers to the risk of extensive project delays.

Given the above observations, MLPL and TasNetworks concluded that the 600 MW and 1200 MW interconnector options that were considered in the PACR are no longer feasible. As such, it would not be appropriate to ask EY to undertake market modelling to consider these options.

EY's updated market modelling – changes to scenarios, inputs and assumptions

EY has undertaken two updates to its market modelling on the gross market benefits for Project Marinus. The first update was undertaken in November 2023, prior to the publication of AEMO's draft 2024 ISP and the second update was undertaken in March 2024 following the publication of AEMO's draft 2024 ISP.

In relation to both updates, EY's analysis compares the total costs of meeting consumers' electricity needs with and without Project Marinus over the 26-year study period from 2024-25 to 2049-50. The difference in the calculated present value of costs is the forecast gross market benefits associated with Project Marinus proceeding. The gross market benefits are discounted to 1 July 2023 using a 7% real, pre-tax discount rate, consistent with the central value applied by AEMO in its draft 2024 ISP, in accordance with the 2023 IASR. The results of the EY's March 2024 update are described below.

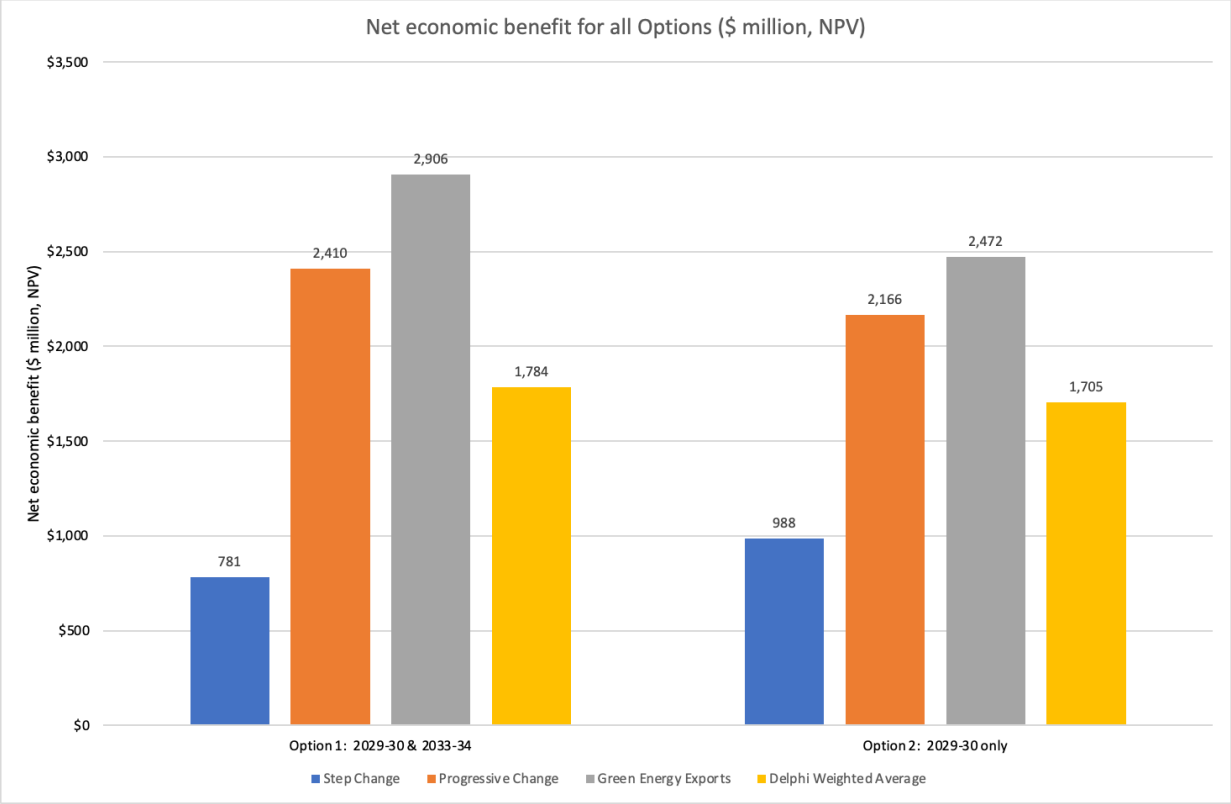
Table 1 shows the gross market benefits for a 750MW and 1500 MW link across the three scenarios using the updated information on project timings from the draft 2024 ISP. To avoid unnecessary modelling and analysis, in its March 2024 update EY only undertook the analysis for the second cable commencing in 2033-34 rather than considering several different commencement dates.

Table 1: EY March 2024 - Updated gross market benefits for Marinus Link, $Million, Real June 2023, discounted to July 2023

Marinus Link Capacity	Timing	Step Change	Progressive Change	Green Energy Exports	Delphi weighted average
1,500 MW	2029-30 & 2033-34	4,035	5,664	6,160	5,038
750 MW	2029-30	3,283	4,460	4,767	4,000

Figure 1 below presents the net market benefit for Marinus Link that is derived from the EY gross market benefits updated in March 2024 and the project cost estimates provided to AEMO for the purposes of its draft 2024 ISP.

Figure 1: Project Marinus net economic benefits by scenario, for one and two cables



Source: Marinus Link

Figure 1 shows that Marinus Link provides material net economic benefit across all scenarios in both the 1500 MW and 750 MW options. It also shows that the 1500 MW option delivers the highest net economic benefit across each of the three scenarios, apart from Step Change. The Delphi weighted average, which is AEMO's adopted weighting of the three scenarios, shows that the second cable provides an incremental net economic benefit of $79 million[9] compared to the single cable option.

In addition to the above analysis, EY undertook sensitivity testing to determine the robustness of the findings to changes in key inputs. Marinus Link and TasNetworks note that there are two credible sensitivities that could produce substantially higher total net economic benefits and higher incremental benefits for cable 2 than indicated in Figure 1. In particular, EY's sensitivity analysis shows that:

- Replacing the hydrogen load trajectory in the Step Change scenario with a more conservative forecast would add more than $1 billion to the total gross economic benefit; and
- A commitment to a 750MW Tasmanian Pumped Hydro Energy Storage project in 2032-33 would increase the total gross economic benefit by approximately $680 million.

9 The incremental net economic benefit of $79 million is $1,784 million for two cables minus $1,705 million for a single cable, assuming the Delphi weighted average.

While these are 'sensitivities' in the context of the RIT-T framework, from a planning perspective it is appropriate to apply a reasonable degree of weight to both cases. At this stage, however, the case for proceeding with Project Marinus does not depend on these sensitivities eventuating.

Conclusions

The outcomes of EY's updated market modelling, combined with the latest project cost information confirms that the preferred option is unchanged from the PACR.

As explained in the PACR, the timing of the second cable will depend on future ISPs which will be informed by actual events and new information that will emerge with the passage of time. It is not necessary to commit now to a specific timeframe for the construction of the second cable. Instead, the project plan is to proceed with the first cable as soon as practicable and to undertake the required work to facilitate the construction and commissioning of the second cable in accordance with the optimal timeframe which will be identified by AEMO in a future ISP.

The attachment to this letter provides further information on the RIT-T update, including a discussion on why Project Marinus is expected to provide significant net economic benefits. Further detailed information is provided in EY's report, which is also provided alongside this letter.

Next steps

We intend to publish and seek stakeholder feedback on EY's report and the attached RIT-T update - Summary Report. In the meantime, if you have any queries on this letter or attachments, please contact me at Prajit.Parameswar@marinuslink.com.au at your earliest convenience.

Yours sincerely,

Prajit Parameswar
Chief Commercial Officer

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RIT-T update - Summary Report

This summary report provides an update of the RIT-T, which was completed for Project Marinus in June 2021 with the publication of the Project Assessment Conclusions Report (**PACR**).

For Project Marinus, the Rules require us to assess whether there has been a material change in circumstances which, in our reasonable opinion, means that the preferred option identified in the PACR is no longer the preferred option.[10] The purpose of this RIT-T update, therefore, is to enable us to form an opinion as to whether the preferred option remains unchanged or not.

The conclusion to draw from the RIT-T update is clear – the preferred option, which is to proceed with the first cable as soon as practicable and to keep the timing of the second cable under review, remains unchanged from the PACR. The timing of the first and second cables are now expected to be slightly later than indicated in the PACR, with the timing of the second cable continuing to be informed by AEMO's 2024 ISP and subsequent ISPs. While the timing has changed slightly, the preferred option has not.

We are seeking stakeholder feedback on this RIT-T Summary Report and the accompanying EY report, which provides detailed information on the market modelling. Submissions should be provided to

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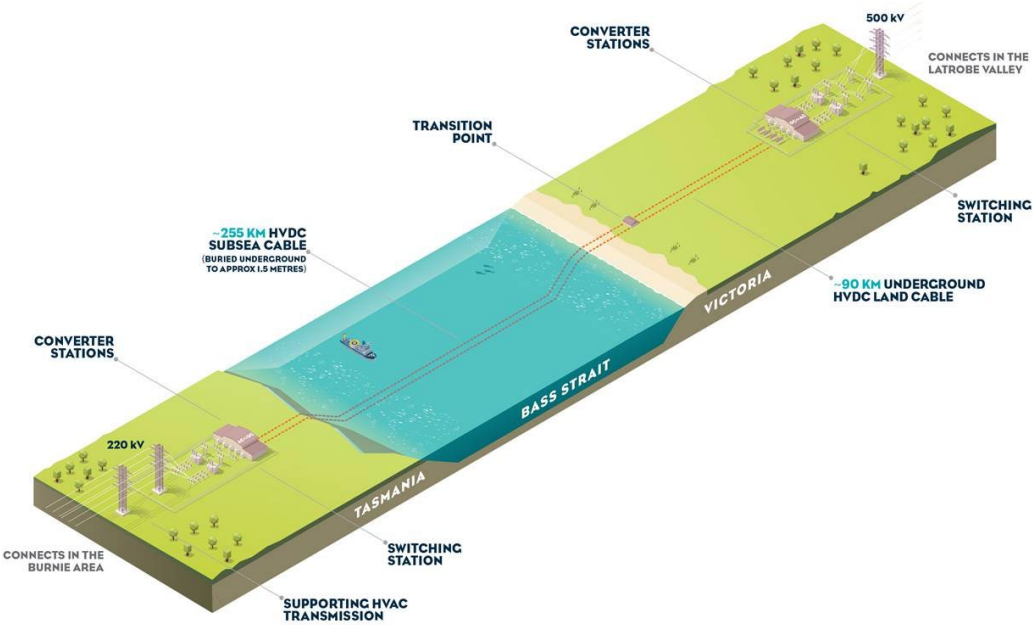
Submissions should be received by 17 May 2024.

10 National Electricity Rules, clause 5.16A.4(n).

1. Project background

Project Marinus comprises Marinus Link and the North West transmission Developments (**NWTD**). Marinus Link involves approximately 255 kilometres of undersea High Voltage Direct Current (**HVDC**) cable and approximately 90 kilometres of underground HVDC cable in Victoria. It also includes converter stations in Tasmania and Victoria, as shown in Figure 2.

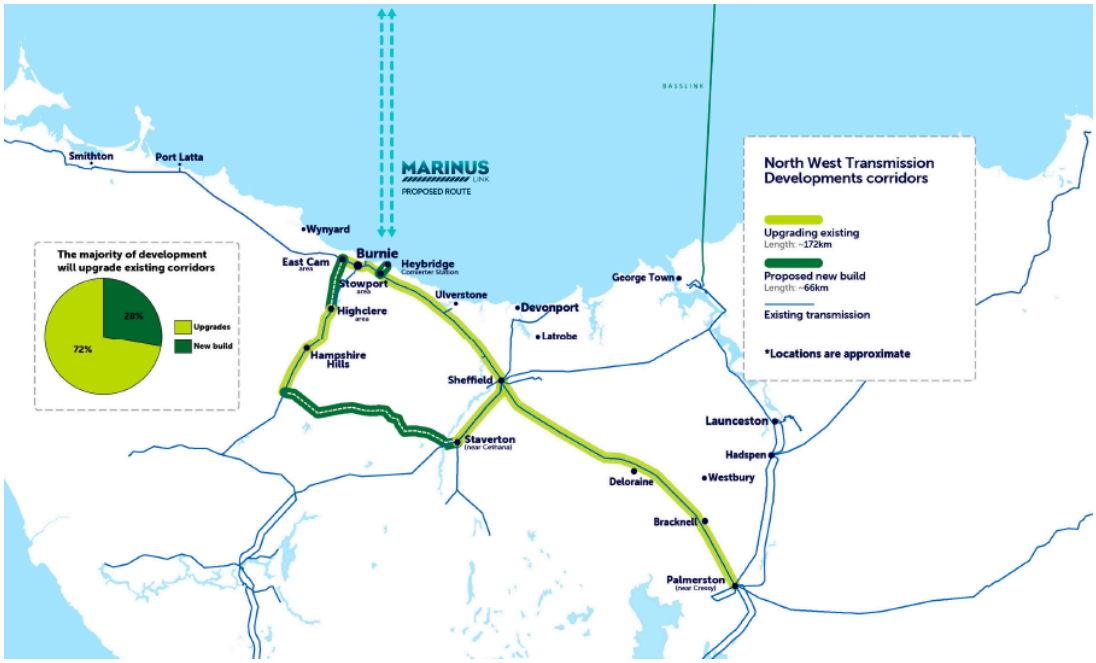
Figure 2: Marinus Link overview



Marinus Link will be owned and operated by MLPL, which has transitioned to three-part equity ownership between the Australian Government (49%), the Victorian Government (33.3%) and the Tasmanian Government (17.7%).

The other component of Project Marinus is the North West Transmission Developments (**NWTD**), which is being progressed by TasNetworks. The NWTD include new and upgraded overhead transmission lines that will link Cressy, Burnie, Sheffield, Staverton, Hampshire, and East Cam. These new and upgraded transmission lines, shown in Figure 3, are required to support the interconnector capacity to be provided by Marinus Link.

Figure 3: North West Transmission Developments



In June 2021, the PACR reached the following conclusion regarding the preferred option for Project Marinus:[11]

> "In accordance with the RIT-T, the preferred option is a 1500 MW HVDC interconnector, comprising two 750 MW HVDC interconnector stages, plus associated AC network upgrades for each stage."

In terms of timing, the PACR explained that the optimal timing would be determined by AEMO's 2022 ISP and subsequent ISPs:[12]

> "In relation to project timing, TasNetworks will proceed with the early works required for Project Marinus to be able to achieve a final investment decision in 2023-24 and subsequent commissioning of Stage 1 from as early as 2027 and Stage 2 by 2029. The actual timing of each stage will be determined by the 2022 and subsequent ISPs and AEMO's assessment of the proposed project in accordance with the feedback loop (as required by clause 5.16A.5(b) of the Rules) and its optimal development path at that time."

2. Why Project Marinus?

During the RIT-T process, stakeholders asked us to go beyond the formal regulatory requirements to explain the sources of benefits that Project Marinus would unlock. As part of this explanation, stakeholders specifically wanted to understand why Project Marinus is preferred to solely increasing battery capacity on mainland Australia, and how Project Marinus interacts with the various policy and project announcements in other NEM regions.

To address these questions, we provided extensive information in the PACR to explain how Project Marinus will deliver benefits to the NEM. In summary, we explained that Stage 1 of Project Marinus (i.e., the commissioning of the first 750 MW link) will enable customers in the NEM to benefit from cost-effective

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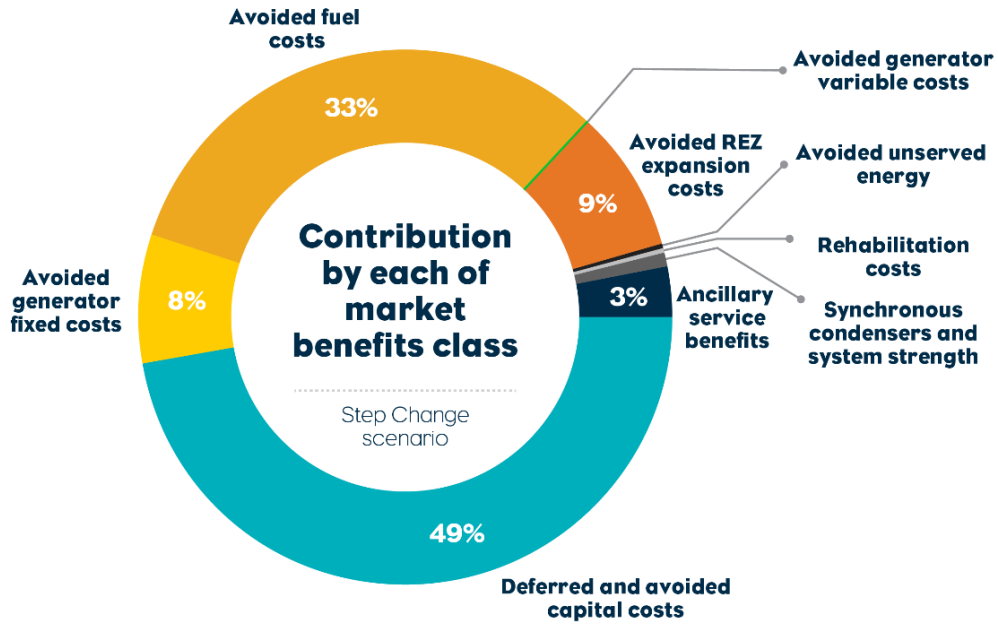
11 TasNetworks, Project Assessment Conclusions Report – Project Marinus, June 2021, page 77.
12 Ibid, page 78.

wind resources, together with the spare capacity that already exists in Tasmania's hydro system. The second 750 MW link (Stage 2) was expected to be in service at least two years after Stage 1, at which time our modelling showed that Australian mainland NEM regions would otherwise require additional peaking gas-fired generation and/or deep storage. By staging Project Marinus, we explained that investment in lower cost storage capacity and wind generation in Tasmania is expected to provide savings to the mainland NEM by displacing more expensive alternatives.

Our benefit assessment showed that strategic transmission investment and long-duration energy storage have a key role to play in addressing the risk associated with 'drought' in Variable Renewable Energy (**VRE**). We also explained that the system modelling understated the benefits of interconnection and deep storage to manage variability and VRE drought. This is because the model employs simplifying assumptions, such as perfect foresight, to manage the computationally intensive nature of the required system analysis. In addition, due to the computational requirements of the ISP and ISP-like long term modelling studies, single (or relatively few) weather traces are used for demand, wind and solar. This single future view tends to understate the size and nature of renewable energy droughts.

The figure below shows the breakdown of the benefits from Project Marinus at the time of the PACR, with the principal sources of benefit being capital expenditure and fuel cost savings. As explained later, while there are extensive changes in the input assumptions and scenarios, the principal sources of benefit provided by Project Marinus remain unchanged.

Figure 4: Breakdown of project benefits, as presented in the PACR[13]



13 Ibid, page 78.

3. AEMO's 2022 ISP

Following the publication of the PACR, AEMO re-examined the case for Project Marinus in its 2022 ISP. At that time, AEMO's cost-benefit assessment found that the economic case for Project Marinus had strengthened since its 2020 ISP:[14]

> "Marinus Link is a single actionable ISP project, without staging between the first and second cables. The optimal delivery in Step Change is 2029-30 for cable 1, and 2031-32 for cable 2. Any delay reduces net market benefits in all scenarios but the unlikely Slow Change."

In relation to actionable ISP projects more generally, AEMO's 2022 ISP highlighted their urgent need in the following terms:[15]

> "The schedule of actionable projects lists the earliest practical delivery time AEMO has been advised by the project proponents. Earlier delivery would either be more optimal to deliver benefits to consumers or would provide valuable insurance and guard against other potential delays. All actionable projects should therefore progress as urgently as possible, and state and Commonwealth mechanisms which support earlier progression of projects could deliver earlier benefits or cost savings."

Given AEMO's findings in the 2022 ISP, Project Marinus has been progressed to ensure that the project could be executed in accordance with the timelines identified by AEMO.

4. New information since the publication of the PACR

The costs of delivering Project Marinus have increased markedly since the expenditure forecasts included in the PACR were developed. International events, such as the war in Ukraine, and emission reduction targets have created an unprecedented global demand for interconnector capacity. During the 'early works' phase of the project, we have worked closely with prospective service providers to obtain cost estimates that reflect the changed market conditions. Our updated cost estimates are provided in Section 6. The cost increases experienced by Project Marinus are aligned with other major transmission projects, as highlighted in AEMO's 2023 Transmission Expansion Options Report.[16]

In addition to the increase in project costs, there have been significant changes to AEMO's inputs, assumptions and scenarios which are detailed in its 2023 IASR. As explained by AEMO, the latest scenarios reflect reduced uncertainty regarding the pace of decarbonisation for the energy sector, particularly since Australia's commitment to net zero emissions by 2050 and updated commitments to the Paris Agreement. The three scenarios in the 2023 IASR are: [17]

- **Green Energy Exports** – reflects very strong decarbonisation activities domestically and globally aimed at limiting temperature increase to 1.5°C, resulting in rapid transformation of Australia's energy sectors, including a strong use of electrification, green hydrogen and biomethane.

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14 AEMO, 2022 Integrated System Plan June 2022, page 73. It should be noted that AEMO's references to Marinus Link are references to Project Marinus, as defined in this Application.

15 AEMO, 2022 Integrated System Plan June 2022, page 18.

16 AEMO, 2023 Transmission Expansion Options Report, September 2023.

17 For further details, please refer to AEMO, 2023 Inputs, Assumptions and Scenarios Report, July 2023, chapter 2.

- **Step Change** – achieves a scale of energy transformation that supports Australia's contribution to limiting global temperature rise to below 2°C compared to pre-industrial levels.

- **Progressive Change** – meets Australia's current Paris Agreement commitment of 43% emissions reduction by 2030 and net zero emissions by 2050. This scenario has more challenging economic conditions, higher relative technology costs and more supply chain challenges relative to other scenarios.

The table below summarises the decarbonisation targets, key demand drivers, technological improvements and other key parameters for each of the scenarios, as set out in the 2023 IASR.

Table 2: AEMO's key parameters for each scenario, 2023 IASR[18]

Parameter	*Green Energy Exports*	*Step Change*	*Progressive Change*
National decarbonisation target	At least 43% emissions reduction by 2030. Net zero by 2050	At least 43% emissions reduction by 2030. Net zero by 2050	At least 43% emissions reduction by 2030. Net zero by 2050
Global economic growth and policy coordination	High economic growth, stronger coordination	Moderate economic growth, stronger coordination	Slower economic growth, lesser coordination
Australian economic and demographic drivers	Higher (partly driven by green energy)	Moderate	Lower
CER uptake (batteries, PV and EVs)	Higher	High	Lower
Consumer engagement such as VPP and DSP uptake	Higher	High (VPP) and Moderate (DSP)	Lower
Energy efficiency	Higher	Moderate	Lower
Hydrogen use	Faster cost reduction. High production for domestic and export use	Medium-Low production for domestic use, with minimal export hydrogen.	Low production for domestic use, with no export hydrogen.
Hydrogen blending in gas distribution network[A]	Up to 10%	Up to 10%	Up to 10%
Biomethane/ synthetic methane	Allowed, but no specific targets to introduce it	Allowed, but no specific targets to introduce it	Allowed, but no specific targets to introduce it
Supply chain barriers	Less challenging	Moderate	More challenging
Global/domestic temperature settings and outcomes[B]	Applies Representative Concentration Pathway (RCP) 1.9 where relevant (~ 1.5°C)	Applies RCP 2.6 where relevant (~ 1.8°C)	Applies RCP 4.5 where relevant (~ 2.6°C)
IEA 2021 World Energy Outlook scenario	Net Zero Emissions (NZE)	Sustainable Development Scenario (SDS)	Stated Policies Scenario (STEPS)

These scenarios are significantly different from the five scenarios developed by AEMO in its 2020 ISP, which were adopted in the RIT-T for Project Marinus. Furthermore, the inputs and assumptions developed by AEMO in its 2023 IASR have changed from the draft 2021 IASR that were adopted in the PACR, being the latest available data at that time. In addition, there have also been numerous policy and market developments, including the timing of coal plant closures and new generation/storage projects, that were not known at the time of the PACR. In aggregate, our view is that these changes, together with the increase in forecast costs for Project Marinus, are material.

From a regulatory perspective, our view is that the Rules require us to assess whether there has been a material change in circumstance which, in our reasonable opinion, means that the preferred option

[18] AEMO, 2023 Inputs, Assumptions and Scenarios Report, July 2023, Table 4, page 20.

identified in the PACR is no longer the preferred option.[19] We therefore engaged EY to update its market modelling to reassess the expected gross market benefits that would be provided by Project Marinus, using the latest available data.

We engaged EY to undertake this work on behalf of MLPL and TasNetworks because:

- EY undertook the market modelling underpinning our 2021 RIT-T PACR and would use the same market expansion model in its updated modelling. This ensures continuity in the modelling approach being applied to inform the assessment of whether the preferred option in the PACR remains unchanged.

- EY's market expansion model is recognised amongst industry as being robust and technology neutral. It examines the total integrated system costs of meeting customers' future electricity needs and assesses the benefits of the project by selecting lowest cost combination of generation, storage, demand-side response and transmission investments. In this way, the model does not favour any type of technology or response.

- EY's modelling methodology follows the AER's Cost Benefit Analysis Guidelines[20] - Guidelines to make ISP Actionable, published in August 2020.

- EY's modelling is capable of being reconciled to AEMO's ISP modelling, as demonstrated in the PACR.

EY's updated market modelling – changes to scenarios, inputs and assumptions

Since the publication of the PACR, EY has undertaken two updates to its market modelling on the gross net market benefits for Marinus Link. The first update was undertaken in November 2023 (**November 2023 update**), prior to the publication of AEMO's draft 2024 ISP and the second update was undertaken in March 2024 (**March 2024 update**) following the publication of AEMO's draft 2024 ISP.

For the November 2023 update, EY adopted the following to calculate the gross benefits for Marinus Link:

- AEMO's 2023 IASR inputs and assumptions and the 2023-24 scenario;

- AEMO's September 2023 demand forecasts provided to MLPL; and

- AEMO's 2022 ISP timing assumptions for major transmission upgrades (i.e., like VNI West).

The key changes in AEMO's 2023 IASR compared to the PACR include:

- **Scenarios** - AEMO's 2023 IASR sets our three scenarios being Progressive Change, Step Change and Green Energy Exports, which have been adopted by AEMO in its draft 2024 ISP. These scenarios

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19 National Electricity Rules, clause 5.16A.4(n). It should be noted that the Material change in network infrastructure project costs Rule 2022 introduced new provisions that clarify how and when the RIT-T must be reapplied. However, this Rule change does not apply to Project Marinus, by virtue of clause 11.154.2.

20 AER, Cost benefit analysis guidelines, Guidelines to make the Integrated System Plan actionable, August 2020.

replace the five scenarios used in the PACR, which were based on AEMO's 2020 ISP, being Slow Change, Central Scenario, Fast Change, High DER and Step Change.[21]

- **Key input assumptions** – the 2023 IASR updates the following assumptions in the PACR, which were based on the draft 2021 IASR:[22]
    - Generation, transmission and fuel costs
    - New candidates for renewable energy zones (**REZs**), including potential offshore wind developments, and
    - Consideration of the potential role for hydrogen.
- **Discount rates** - the 2023 IASR also uses different discount rate compared to the PACR to reflect the latest market condition. In particular, the 2023 IASR adopts a central pre-tax real rate of 7%, compared to the PACR which adopted a discount rate of 4.8 per cent for all scenarios, except for Slow Change, which used 3.8 per cent.

Table 3 shows the key input assumptions adopted by EY for each of the three scenarios specified in the 2023 IASR, which were adopted in EY's November 2023 analysis.

Table 3: Summary of EY's key input assumptions for 2023 IASR scenarios [23]

Key drivers input parameter	Scenario		
	Step Change	Progressive Change	Green Energy Exports
Underlying consumption	2023 ESOO – Step Change	2023 ESOO – Progressive Change	2023 ESOO – Green Energy Exports
Committed and anticipated generation	Committed and anticipated generators from the 2023 IASR Assumptions Workbook		
New entrant capital cost for wind, solar PV, SAT, OCGT, CCGT, PHES large-scale batteries and hydrogen turbine	2023 IASR Assumptions Workbook – Step Change	2023 IASR Assumptions Workbook – Progressive Change	2023 IASR Assumptions Workbook – Green Energy Exports
Retirements of coal-fired power stations	2023 IASR Assumptions Workbook: In line with expected closure year, or earlier if economic or driven by decarbonisation objectives.		
Gas fuel price	2023 IASR Assumptions Workbook – Step Change	2023 IASR Assumptions Workbook – Progressive Change	2023 IASR Assumptions Workbook – Green Energy Exports

21 It should be noted that while 'Step Change' appears in both the 2020 ISP and 2024 ISP, the input assumptions are significantly different, which means that these scenarios are not actually the same.

22 AEMO, Draft 2021 IASR, December 2020

23 EY, Gross market benefit assessment of Marinus Link, March 2024, Table 5.

Key drivers input parameter	Scenario		
	Step Change	Progressive Change	Green Energy Exports
Coal fuel price	2023 IASR Assumptions Workbook – Step Change	2023 IASR Assumptions Workbook – Progressive Change	2023 IASR Assumptions Workbook – Green Energy Exports
NEM carbon budget	2023 IASR Assumptions Workbook – Step Change: 681 Mt CO_2-e 2024-25 to 2051-52	2023 IASR Assumptions Workbook – Progressive Change: 1,203 Mt CO_2-e 2024-25 to 2051-52	2023 IASR Assumptions Workbook – Green Energy Exports: 357 Mt CO2-e 2024-25 to 2051-52
Victoria policy	Victoria Renewable Energy Target (**VRET**) – 40% by 2025, 65% by 2030 and 95% by 2035 Victoria Energy Storage Target – 2.6 GW by 2030 and 6.3 GW by 2035 Victoria Offshore Wind Target – 2 GW by 2032, 4 GW by 2035 and 9 GW by 2040 Consistent with 2023 IASR Assumptions Workbook		
Queensland Renewable Energy Target (**QRET**)	50% by 2029-30, 70% by 2031-32 and 80% by 2034-35 Consistent with 2023 IASR Assumptions Workbook		
Tasmanian Renewable Energy Target (**TRET**)	100% by 2022, linear trajectory from the mid-2020s to 150% available renewable generation by 2030 and 200% by 2040 as a percentage of 2020 demand in Tasmania. The trajectory can be exceeded if part of the least cost solution. Consistent with 2023 IASR Assumptions Workbook		
NSW Electricity Infrastructure Roadmap	NSW Roadmap, with at least the same amount of electricity as 8 GW in New England, 3 GW in the Central West Orana (**CWO**) REZ and 1 GW of additional capacity and 2 GW of long duration storage (8 hrs or more) by 2029-30. Consistent with 2023 IASR Assumptions Workbook		
Victorian SIPS	300 MW/450 MWh, 250 MW for SIPS service during summer. In the summer months the remaining 50 MW can be deployed in the market on a commercial basis, in the winter months the full capacity is available. From April 2032 the full capacity is available to the market. Consistent with 2023 IASR Assumptions Workbook		
EnergyConnect	2022 ISP anticipated project: EnergyConnect commissioned by July 2026		
Western Renewables Link	2022 ISP anticipated project. Western Victoria upgrade commissioned by July 2026		
HumeLink	2022 ISP outcome – Step Change: HumeLink commissioned by July 2028	2022 ISP outcome – Progressive Change: HumeLink commissioned by July 2035	2022 ISP outcome – Hydrogen Superpower: HumeLink commissioned by July 2027
New-England REZ Transmission	2022 ISP outcome – Step Change: New England REZ Transmission Link commissioned by July 2027, New England REZ Extension commissioned by July 2035	2022 ISP outcome – Progressive Change: New England REZ Transmission Link commissioned by July 2027, New England REZ Extension commissioned by July 2038	2022 ISP outcome – Hydrogen Superpower: New England REZ Transmission Link commissioned by July 2027, New England REZ Extension commissioned by July 2031

Key drivers input parameter	Scenario		
	Step Change	Progressive Change	Green Energy Exports
Marinus Link	Several different timings: The first stage of Marinus Link commissioned during 2029-30 and different timings for the second stage of Marinus Link ranging in two-year increments from 2031-32 to 2035-36.		
QNI Connect	2022 ISP outcome – Step Change: QNI Connect commissioned by July 2032	2022 ISP outcome – Progressive Change: QNI Connect commissioned by July 2036	2022 ISP outcome – Hydrogen Superpower: QNI Connect commissioned by July 2029
VNI West	2022 ISP outcome – Step Change: VNI West commissioned by July 2031	2022 ISP outcome – Progressive Change: VNI West commissioned by July 2038	2022 ISP outcome – Hydrogen Superpower: VNI West commissioned by July 2030
Snowy 2.0	Snowy 2.0 is commissioned by December 2029 Consistent with the 2023 IASR Assumptions Workbook		
Borumba PHES	Borumba PHES is commissioned by July 2030 Consistent with the nearest financial year in the 2023 IASR Assumptions Workbook		

For the purpose of its March 2024 analysis, EY updated its market modelling to take account of the following changes:

- Alignment of major transmission augmentation timings (except for Marinus Link) in the draft 2024 ISP, which were not available for EY's November 2023 update;
- Alignment of the expected closure dates for Queensland coal-fired generators; and
- Revised virtual power plants assumed contributions to meeting the Victorian Energy Storage Target of 2.6 GW by 2030 and 6.3 GW by 2035.

While it was expected that these changes would not materially impact the gross market benefits estimated in November 2023, MLPL and TasNetworks considered it important that EY's modelling is as closely aligned as possible with the latest ISP.

5. Outcomes from EY's updated market modelling

EY's market model identifies the least cost solution for meeting forecast customers' electricity needs over the 26-year period from 2024-25 to 2049-50. The model is computationally complex as the analysis is conducted on an hourly basis; allows for the commissioning of all types of generation and storage capacity; and the withdrawal of existing generation on a least-cost basis.

EY's model estimates the gross benefits of Project Marinus for each of the scenarios adopted in the draft 2024 ISP by conducting a 'with and without' test. The gross benefit attributed to Project Marinus is the difference in the total resource costs 'with and without' Project Marinus, expressed in present value terms. We asked EY to examine the gross benefits for Project Marinus, assuming that the first cable is commissioned in 2029-30 and allowing the timing of the second cable to be varied. This approach was adopted for the following reasons:

- The tender process and negotiations with service providers is based around a commissioning date for the first cable in 2029-30, or earlier; and

- The preferred option in the PACR adopted a commissioning date for the first cable in 2029-30, or earlier, with the timing of the second cable to be determined.

In terms of cable capacity, our discussions with prospective service providers have confirmed the conclusion in the PACR that the optimal incremental cable capacity is 750 MW. Accordingly, we did not ask EY to model the gross project benefits for different cable capacities. In making this decision, we also recognised that a 600 MW cable, for example, could not be delivered within the current project timeframes as the tender process and negotiations would need to be restarted given the materiality of the change. Accordingly, we concluded that the 600 MW and 1200 MW interconnector options considered in the PACR are no longer credible.

Table 4 sets out the results of the November 2023 market modelling for each of the draft 2024 ISP scenarios, testing different capacities and timings for Marinus Link. It should be noted that the gross market benefits only relate to the 26 year study period from 2024-25 to 2049-50. Therefore, the total gross market benefits over the life of the asset will be substantially higher than shown below.

Table 4: EY November 2023 - Updated gross market benefits for Marinus Link, $Million, Real June 2023, discounted to July 2023

Marinus Link Capacity	Timing	Step Change	Progressive Change	Green Energy Exports	Delphi weighted average
1,500 MW	2029-30 & 2031-32	4,336	6,038	6,395	5,359
	2029-30 & 2033-34	4,224	5,953	6,164	5,241
	2029-30 & 2035-36	4,105	5,812	5,914	5,093
750 MW	2029-30	3,502	4,691	4,768	4,191

Table 4 shows that if the first cable is commissioned in 2029-30, then the gross benefits from Project Marinus vary from $4,105 million to $6,395 million in present value terms, depending on the scenario and the timing of the second cable. The benefits from the first cable are substantially greater than the incremental benefits for the second cable.

EY undertook a range of sensitivity analysis to test the robustness of the magnitude of the gross benefits in Table 4. These sensitivities found that, notwithstanding that the benefits from the first cable are substantially greater than the incremental benefits for the second cable, there are highly credible circumstances that would significantly enhance the economic case for the two cable option. In particular, EY's sensitivity analysis shows that:

- Replacing the hydrogen load trajectory in the Step Change scenario with a more conservative forecast would add more than $1 billion to the total gross economic benefit; and

- A commitment to a 750MW Tasmanian Pumped Hydro Energy Storage project in 2032-33 would increase the total gross economic benefit by approximately $680 million.

While these are 'sensitivities' in the context of the RIT-T framework, from a planning perspective it is appropriate to apply a reasonable degree of weight to both cases. For example, we note that there is significant uncertainty regarding the scale, timing and location of hydrogen load in the NEM and, therefore, it is reasonable to consider a less ambitious hydrogen load in Tasmania. In addition, the completion of the first cable and the opportunities it provides may promote an early commitment to a Pumped Hydro Energy Storage project in Tasmania.

March 2024 modelling results

Table 5 shows the outcomes of March 2024 modelling results which reassess the gross market benefits for a 750MW and 1500 MW link, using the updated information described earlier, assuming that the second cable commences in 2033-34.

Table 5: EY March 2024 - Updated gross market benefits for Marinus Link, $Million, Real June 2023, discounted to July 2023

Marinus Link Capacity	Timing	Step Change	Progressive Change	Green Energy Exports	Delphi weighted average
1,500 MW	2029-30 & 2033-34	4,035	5,664	6,160	5,038
750 MW	2029-30	3,283	4,460	4,767	4,000

Table 6 shows the changes for these gross marked benefits estimated by EY in March 2024 compared to the November 2023 estimates.

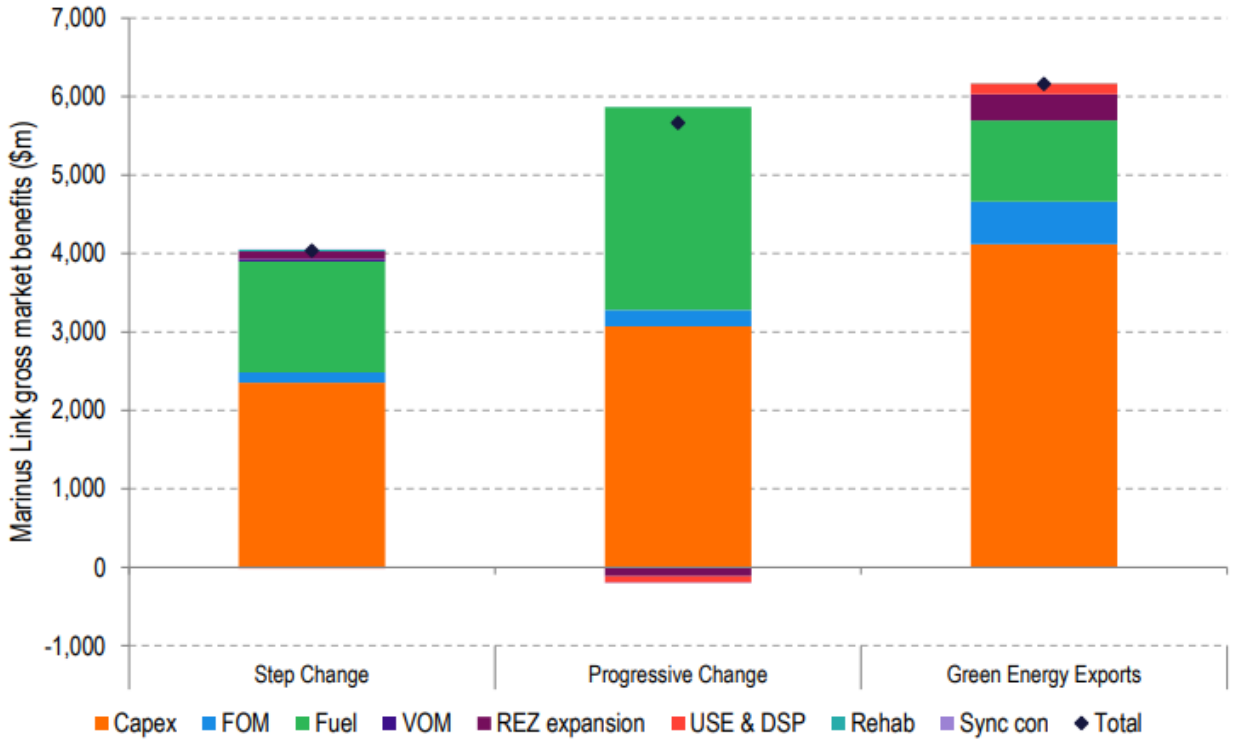
Table 6: Change in gross market benefits for Marinus Link, $Million, Real June 2023, discounted to July 2023

Marinus Link Capacity	Timing	Step Change	Progressive Change	Green Energy Exports	Delphi weighted average
1,500 MW	2029-30 & 2033-34	(-189)	(-290)	(-4)	(-204)
750 MW	2029-30	(-219)	(-231)	(-1)	(-191)

Table 6 shows that the gross market benefits have reduced compared to the November 2023 update, but not materially so. Given the above results, MLPL and TasNetworks concluded that it was unnecessary for EY to repeat the updated analysis for the remaining timing options for cable 2 that were considered in November 2023.

In addition to providing the gross benefit calculation, during our consultation process with MLPL's Consumer Advisory Panel (**CAP**), the CAP asked MLPL to explain the sources of benefits that Project Marinus is expected to provide. Figure 5 provides this information, as assessed by EY in its March 2024 update.

Figure 5: EY's modelled breakdown of project benefits by scenario, with cable 2 by 2033-34. Dollar values are presented in $million, real June 2023.[24]



EY's updated modelling confirms the earlier findings in the PACR that Project Marinus principally provides savings in capital expenditure and fuel costs. At a high level, these benefits arise for the following reasons:

- **Capital expenditure savings**. By better connecting Tasmania with the mainland, Marinus Link is forecast to unlock the potential for high quality Tasmanian wind, new entry pumped hydro and existing conventional Tasmanian hydroelectric power stations. Without Marinus Link, there is a requirement for higher cost renewable, storage and gas capacity on the mainland.

- **Fuel cost savings**. Marinus Link is forecast to provide fuel cost savings on the mainland by enabling better access to existing Tasmanian hydroelectric generators, as a lower cost alternative to the construction and operation of dispatchable gas on the mainland.

While the market modelling is highly complex, it is also useful to explain why the magnitude of these benefits vary depending on the scenarios adopted. The following summary provides a high-level explanation for each scenario:

- **Step change**. Under this scenario Project Marinus provides access to higher capacity factor Tasmanian wind resource, displacing higher cost wind capacity that would otherwise be required on the mainland. The market modelling shows a decreased reliance on gas generation in later years by improving diversity in generation sources and load.

[24] EY, Gross market benefit assessment of Marinus Link, March 2024, Figure 14.

- **Progressive change**. This scenario has a lower demand growth in Tasmania, which means that increased renewable energy is available to be exported to the mainland. The availability of lower cost generation means that more expensive gas generation and mainland renewable capacity can be displaced with Project Marinus, which results in greater savings in capital expenditure and fuel cost.

- **Green Energy Exports.** The combination of the higher demand growth in this scenario and the increased VRE required to meet this demand provides greater opportunity for Project Marinus to offset mainland capacity development. As a result, the capital expenditure savings are higher in this scenario. However, the constraints imposed by the carbon budget restricts the amount of coal and gas generation under this scenario. As a result, the fuel savings provided by Project Marinus are lower under this scenario, while the total benefits are slightly higher than the progressive change scenario.

Further information on the scenarios and the gross benefit assessment is provided in EY's report, published alongside this report.

6. Net economic benefit assessment

To calculate the net economic benefit for a project option, the costs of that option must be deducted from the gross benefits, expressed in present value terms. The updated costs for Project Marinus reflect the latest available information from our 'early works' phase of the project, which commenced in July 2021. A key purpose of 'early works' is to obtain a better estimate of the project costs through extensive effort on the planning activities, including:

- Landowner and community engagement programs, including Traditional Owners, and stakeholder relations;

- Land and easement acquisition;

- Environmental impact assessments;

- Technical designs and specifications; and

- Procurement strategy and execution.

The adopted in this RIT-T update are the total costs of the project over the study period, which is shorter than the project life, varies depending on the assumed timing of cable 2. It should be noted that the cost estimates are used in the net economic benefit assessment ensure that project costs and benefits are consistently measured over the same study period.[26]

[26] As the study period is truncated (i.e., it is shorter than the life of the project), it is necessary to capture an appropriate portion of the total project costs to calculate the net economic benefit. In the case of Project Marinus, this approach is likely to understate the net economic benefit over the life of the project because the annual benefits exceed the annual costs towards the end of the study period. On the reasonable assumption that this situation persists beyond the study period, the net economic benefit over the life of the project will exceed the net economic benefit calculated over the truncated study period.

Our project cost estimates used in this RIT-T update are set out below ($June 2023):

- The total costs for Project Marinus are estimated to be $6,575 million, which comprises costs of $4,040 million for the first stage (which includes facilitation for stage 2), and $2,535 million for completion of the second stage.

- The NWTD component is $950 million for the first stage, and $525 million for the second stage.

MLPL and TasNetworks will continue to refine the cost estimates as new information has become available from the tender process. This updated cost information will be provided to AEMO through the feedback loop process, in accordance with clause 5.16A.5 of the Rules. The extent of any change to the cost estimate will not be material in the context of this RIT-T update.

Figure 6 below shows the net economic benefit for Project Marinus, assuming that the first cable is delivered in 2029-30 and the second cable in 2033-34. It presents the results for a single cable, i.e., a 750 MW option, and for two cables, i.e., a 1500 MW option across each of the three scenarios. The figure also shows the Delphi weighted average, which reflects the views of a panel of experts on the likelihood of the various scenarios eventuating.

Figure 6: Project Marinus net economic benefits by scenario, for one and two cables

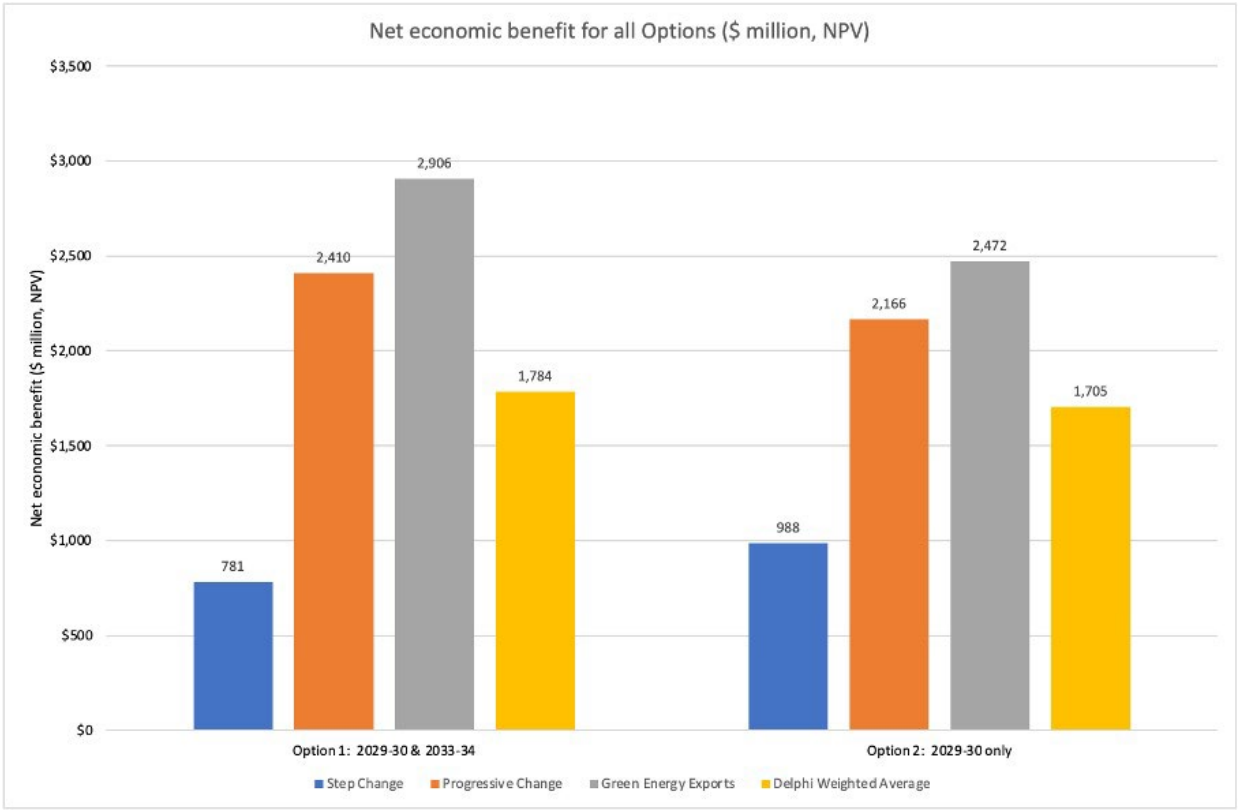


Figure 6 shows that each of the options, reflecting different cable timings for the second cable, delivers a net economic benefit. It also shows the net economic benefits from the first cable are substantially greater than the incremental benefits for the second cable. Nevertheless, the second cable provides a net economic benefit compared to the first cable for each scenario, apart from 'Step Change.' The Delphi weighted average, which is AEMO's adopted weighting for the three scenarios, also shows that the second cable is expected to provide an incremental net economic benefit compared to the single cable option.

7. Conclusion and next steps

The conclusion to draw from the RIT-T update is clear – the preferred option, which is to proceed with the first cable as soon as practicable and to keep the timing of the second cable under review, remains unchanged from the PACR. The timing of the first and second cables are now expected to be slightly later than indicated in the PACR, with the timing of the second cable continuing to be informed by AEMO's 2024 ISP and subsequent ISPs. While the timing has changed slightly, the preferred option has not.