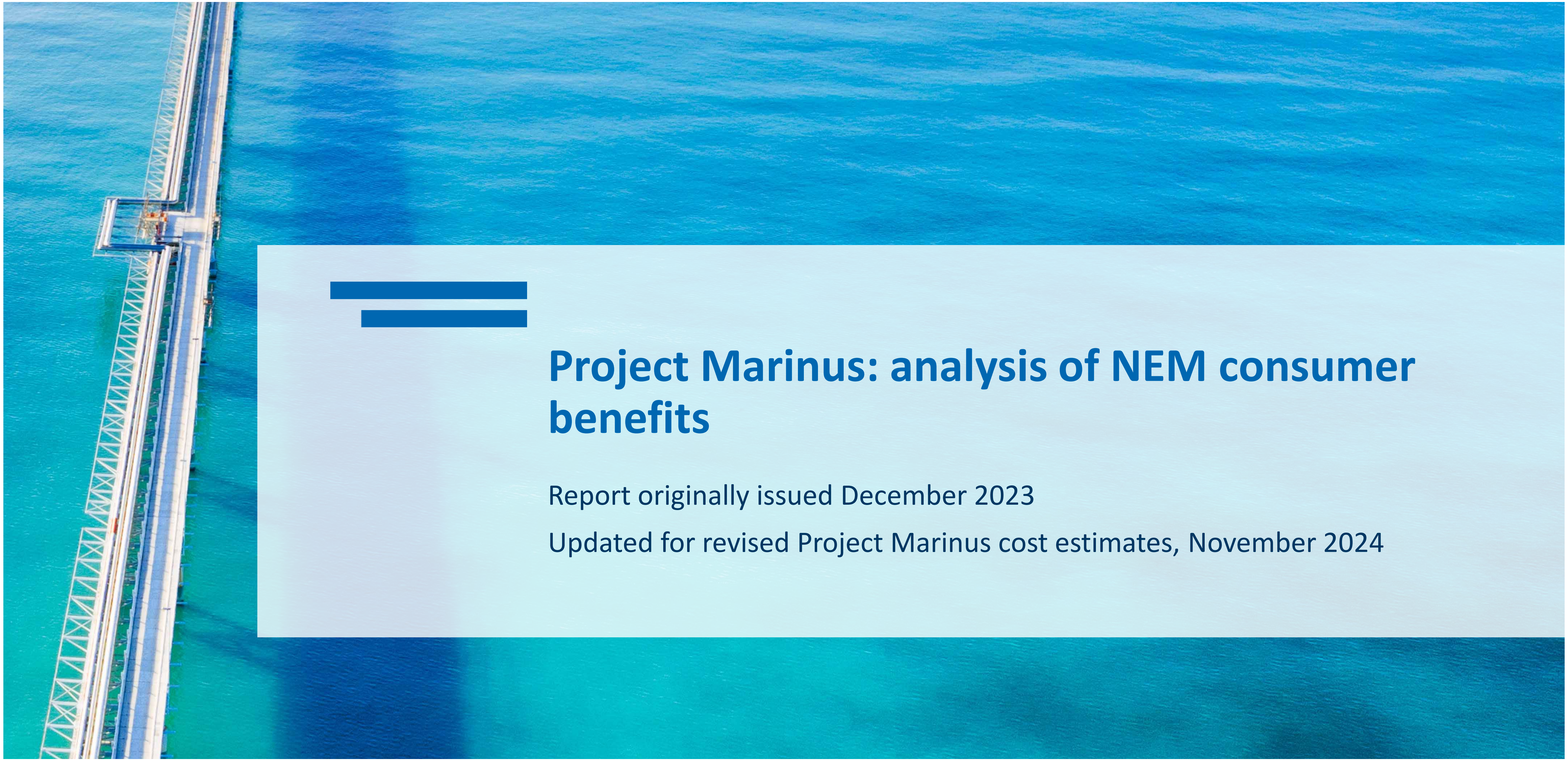

Project Marinus: analysis of NEM consumer benefits

Report originally issued December 2023

Updated for revised Project Marinus cost estimates, November 2024

FTI CONSULTING

November 2024

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Executive Summary

Background and key findings

Background and Context

- Marinus Link ("Project Marinus") is a proposed interconnector between Tasmania and Victoria being developed by Marinus Link, a subsidiary of TasNetworks.
- It is proposed to be composed of either one or two High Voltage Direct Current ("HVDC") links with capacities of 750 MW each. For the purposes of modelling, the first stage is targeted to be in operation in calendar year 2030 with the second stage assumed to be in operation by the end of calendar year 2032. The timing for operation of the second stage is under review and continuing to be informed by AEMO's 2024 ISP and subsequent ISPs.
- It would be the second interconnector (after Basslink, a 478 MW HVDC link) developed between Tasmania and Victoria.
- It is expected that in parallel with the introduction of Project Marinus, Tasmania would develop a combination of dispatchable and variable renewable energy ("VRE") generation capacity. Notably, this includes the development of new pumped hydro storage and upgrades to existing hydro capacity (together known as the 'Battery of the Nation') and high capacity factor wind.
- FTI Consulting ("FTI") has been engaged by Marinus Link to assess the benefits of Project Marinus for consumers in Australia's National Electricity Market ("NEM") as a result of expected changes in wholesale electricity prices and interconnector residues, relative to the costs of the project.
- This report presents our findings and is an update to our work for TasNetworks in 2020, which also assessed the benefits of Project Marinus to consumers in the NEM.[1]
- AEMO's 2022 Integrated System Plan ("ISP") found that Project Marinus is expected to provide a market benefit of $4.6bn in net present value terms.[2]

Key findings

Project Marinus is expected to generate $10.4bn to $16.9bn of consumer benefits from lower wholesale electricity prices across the NEM, significantly exceeding the costs of construction[3]

- From 2031 to 2050, Project Marinus and the additional Tasmanian generation capacity it facilitates are expected to deliver **$14.8bn to $16.9bn** in consumer benefits (for two Marinus Link cables) across the NEM in net present value terms, before taking into account the costs of construction and operation and changes in interconnector residues.[4] For one Marinus Link cable, consumer benefits are estimated to be **$10.4bn to $11.8bn**.
- The expected reduction in wholesale prices is driven by **increased access to high-quality wind resources in Tasmania,** as well as to the existing Tasmanian hydroelectric fleet and high-quality new entrant pumped hydro energy storage**.** The electricity generated by this capacity is expected to be exported to the NEM, leading to **reduced dispatch of gas generation and demand response and, consequently, lower wholesale electricity prices.**
- This compares to the expected costs of Project Marinus across the same period of **$2.4bn** for one cable **and $4.0bn** for two cables, including associated costs of the North-West Transmission Developments ("NWTD") Project.[5]

These benefits arise from expected reductions in wholesale electricity prices that consumers across the states in NEM should see in their energy bills

- For two cables, average wholesale electricity prices are estimated to fall by **$20 to $22 per MWh for Tasmania** and **$17 to $20 per MWh for Victoria.** For one cable, the fall in electricity prices is expected to be **$12 to $13 per MWh for Tasmania** and **$13 to $14 per MWh in Victoria.**
- The effect of the reduction in wholesale electricity prices is expected to equate to an annual **$148 to $165** reduction in energy bills in Tasmania for two cables. This falls to **$90 to $97** for one cable.
- For Victorian consumers, this is expected to be **$70 to $78** for two cables and **$51 to $56** for one cable.
- Reductions in consumer energy bills due to lower wholesale electricity prices are expected across all states in the NEM ranging from **$15 to $35** for two cables and **$10 to $23 per household** for one cable.

Our assessment indicates Project Marinus can be expected to generate net benefits of $7.3bn to $11.7bn for consumers in the NEM

- We estimate the **net impact** on consumers across the NEM by also taking into account the impact on interconnector residues[6] and costs of Project Marinus in net present value terms.
- We estimate the net benefits to be **$9.2bn to $11.7bn** for two cables and **$7.3bn to $9.1bn** for one cable.

(1) FTI Consulting, *Assessing the benefits of Project Marinus – Final Report, August 2020.* (2) AEMO, *2022 Integrated System Plan – Appendix 6. Cost Benefit Analysis* (link), pages 43 & 44. Figure reported applies to "Step Change" scenario. (3) Range reflects our assessment across different scenarios. (4) See page 15 for an explanation of interconnector residues. (5) NWTD is being undertaken by TasNetworks to upgrade transmission network infrastructure in Tasmania (link). See page 15 for more details on Project Marinus costs. (6) Average load-weighted prices across modelled period of 2031-50.

Background and Context

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Background and context

About Marinus Link

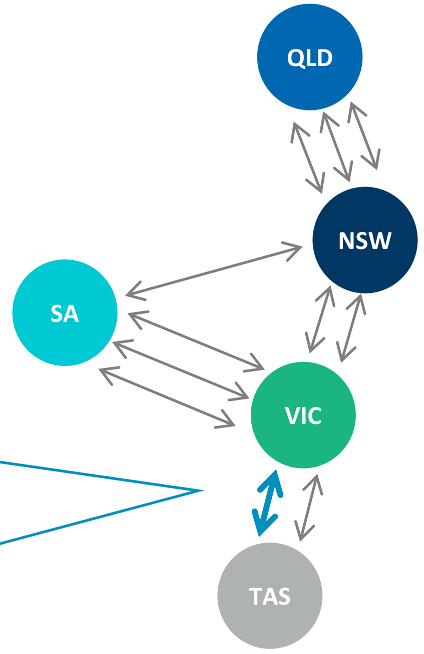
- Marinus Link ("Project Marinus") is a proposed 1,500 MW High Voltage Direct Current ("HVDC") interconnector between Tasmania and Victoria being developed by Marinus Link, composed of two cables of 750 MW each. It would be the second interconnector (after Basslink, a 478 MW HVDC link) developed between Tasmania and Victoria.
- The Australian Energy Market Operator's ("AEMO") 2022 Integrated System Plan ("ISP") found that Project Marinus is expected to provide a market benefit of $4.6bn net present value terms.[1]
- For the purposes of modelling, the first stage is targeted to be in operation in calendar year 2030 with the second stage assumed to be in operation by the end of calendar year 2032. The timing for operation of the second stage is under review and continuing to be informed by AEMO's 2024 ISP and subsequent ISPs.
- AEMO expects that Project Marinus will provide greater access to Tasmania's dispatchable and variable renewable energy ("VRE") generation capacity, providing resource diversity and reducing the need for additional capacity on the mainland.[2] Specifically, this includes the development of new pumped hydro storage and upgrades to existing hydro capacity (together known as the 'Battery of the Nation') and high capacity factor wind.[3]

Project Marinus

A proposed **1,500 MW HVDC interconnector.**

The **second interconnector between Tasmania and Victoria.**

Modelled **delivery dates of July 2030** and **January 2033** for link 1 and link 2 (each 750 MW) respectively.



Context of this report

- FTI Consulting ("FTI") has been engaged by Marinus Link to produce an updated assessment of the benefits of Project Marinus to consumers in the NEM.
- Since FTI's work in 2020, changes have occurred in the NEM which have highlighted the need to refresh the analysis of the benefits of Project Marinus on NEM consumers, including:
  - AEMO updated its NEM Optimal Development Path in its 2022 ISP, in which Project Marinus was made an actionable project.
  - Australian governments have introduced tighter emissions targets and coal is being retired faster than previously expected.
  - Multiple emissions policy positions have been updated, including the national 2030 emissions target, the recently announced expanded Capacity Investment Scheme and VRET.[4]
  - AEMO has updated its forecast NEM emission trajectories, which are modelled as carbon budgets.[5]
  - The estimated cost of the Marinus cables have been updated.[6]
  - Updates to the Renewable Energy Zones ("REZs"), including a new candidate offshore REZ in North-East Tasmania, and updates to the resource limits (MW) of each offshore REZ in the NEM.[7]
  - Forecasts for higher electricity consumption in Tasmania in the short to medium-term, largely due to the anticipated growth of the hydrogen production industry.[8]
- In this report, we therefore update our 2020 analysis to take account of the latest forecasts and information contained within AEMO's 2023 Inputs, Assumptions and Scenarios Report ("IASR") and Electricity Statement of Opportunities ("ESOO").
- The report is intended to complement existing analysis on Project Marinus, such as FTI's work in 2020, and any existing or updated RIT-T analysis. It presents a consumer-focused welfare analysis, focusing on the benefits of Project Marinus in terms of its impact on wholesale electricity prices across the NEM.

(1) AEMO, *2022 Integrated System Plan – Appendix 6. Cost Benefit Analysis* (link), pages 43 & 44. (2) AEMO, *2022 Integrated System Plan*, June 2022 (link), page 73. (3) For example, AEMO identify wind opportunities of in 1.1 GW (Central Highlands) and 1.3 GW (North West). AEMO, *2022 Integrated System Plan*, June 2022 (link), page 43. (4) AEMO, *2023 Inputs Assumptions and Scenarios Report*, July 2023 (link), page 26. (5) AEMO, *2023 Inputs Assumptions and Scenarios Report*, July 2023 (link), page 46. (6) Source: Marinus Link (7). AEMO, *2023 Inputs Assumptions and Scenarios Report*, July 2023 (link), pages 128-133 (8) AEMO, *2023 Electricity Statement of Opportunities*, August 2023 (link), page 146.

The NEM is undergoing a rapid transition away from thermal generation capacity towards renewable power sources including wind and solar

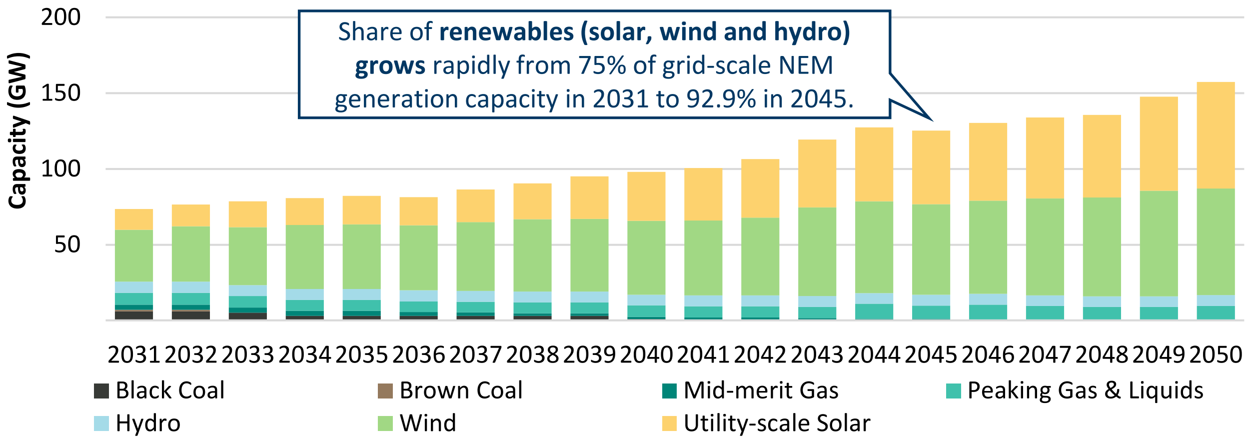
NEM is transitioning rapidly to renewables and since 2020, the move away from coal has accelerated

- The **NEM is currently undergoing a period of rapid transition**, driven by government policy and net zero ambitions. Examples of such policies include:
  - Tasmanian Renewable Energy Target ("TRET"): Increase Tasmania's renewable energy output by 200% based on 2022's renewable energy figures.[1]
  - Victorian Renewable Energy Target ("VRET"): The Victorian Government has announced an intention to legislate updated targets for the proportion of electricity generated by renewable energy to 65% by 2030 and 95% by 2035.[2]
  - Capacity Investment Scheme ("CIS"): The Federal Government has developed a national framework to target 9 GW of clean dispatch capacity and 23 GW of variable capacity nationally.[3]
- Both the way electricity is generated and how it is consumed is evolving:
  - **Generation is shifting away from thermal generation, most notably coal, towards renewables** sources such as wind, solar and hydro.
  - **Coal generation capacity is expected to be rapidly** phased out. AEMO expects that by 2031, 67% of the NEM's total coal capacity in 2023[4] will be retired.
  - Meanwhile, AEMO also expects **wind and solar generation capacity to grow** from 20 GW in 2023, to 84 GW by 2040 and 139 GW by 2050.[5]
  - **Net demand for electricity from the grid is also developing**, as technologies including residential solar, batteries, and electric vehicles grow in prevalence and impact the flexibility and profile of consumers' net demand.
- AEMO notes that Project Marinus is considered "nationally strategic" and listed Project Marinus as an **actionable project** in the 2022 ISP.[6]

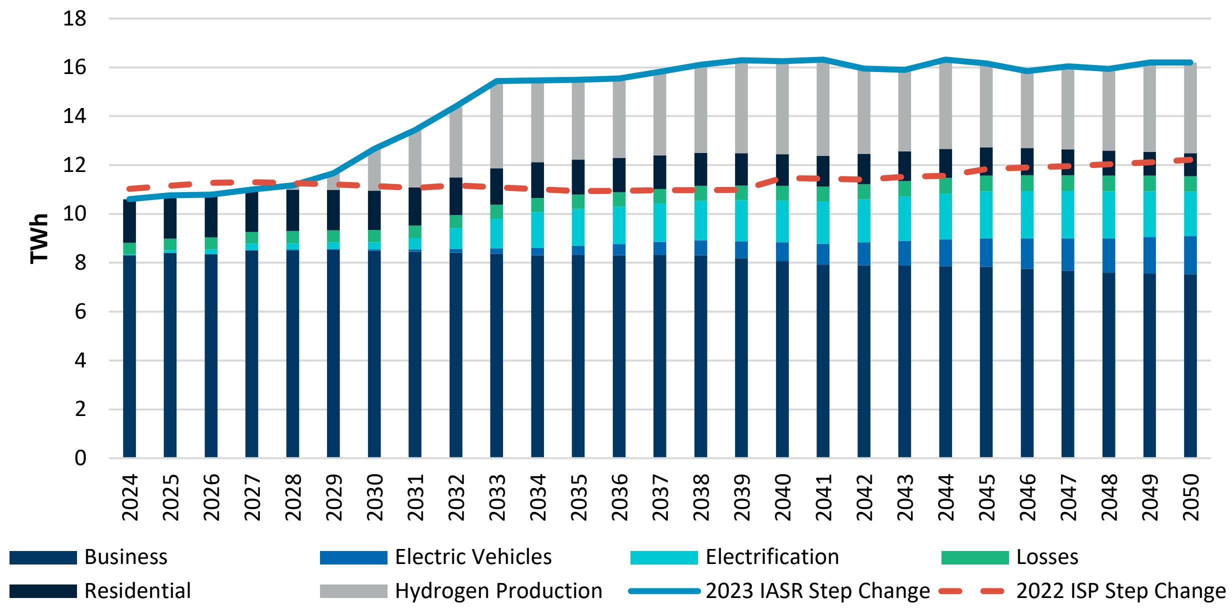
Within Tasmania, expectations for hydrogen consumption has increased significantly in recent years

- The Step Change scenario set out in AEMO's 2023 IASR forecasts incorporates significantly higher annual electricity consumption compared to the Step Change scenario in the 2022 ISP.[7]
  - By 2033, there is forecast to be more than **4.3 TWh** of additional consumption in the 2023 IASR compared to the 2022 ISP. In 2050, this difference is forecast to still be nearly **4 TWh** in 2050.
  - This difference is driven mainly by an increase in consumption due to hydrogen production, with the 2023 IASR forecasting around **3.5 TWh** per annum of such consumption from 2033 to 2050.
- The forecast increase in demand in Tasmania represents a significant increase over 2022 ISP, where hydrogen consumption in Tasmania was estimated to be 1.5 TWh by 2050.

NEM Installed Capacity, 2022 ISP Step change scenario[8,9]



Tasmania Electricity Consumption, 2023 IASR Step change scenario[10]



(1) Department of State Growth, Tasmanian Government, *Tasmanian Renewable Energy Action Plan,* December 2020 (link) (2) Department of Energy, Environment and Climate Action, *Victorian renewable energy and storage targets*, February 2023 (link) (3) Department of Climate Change, Energy, the Environment and Water, *Capacity Investment Scheme* (link) (4) AEMO, *2022 Integrated System Plan*, June 2022 (link) (5) AEMO, *2022 Integrated System Plan*, June 2022 (link) (6) AEMO, *2022 Integrated System Plan*, June 2022 (link), pages 13, 29. (7) AEMO, *2023 IASR Assumptions Workbook*, August 2023 (link) (8) AEMO, *2022 Integrated System Plan*, June 2022 (link) (9) Throughout the report, all dates in charts show financial year ending unless otherwise stated (10) AEMO, *National Electricity & Gas Forecasting*, August 2023 (link).

Modelling approach

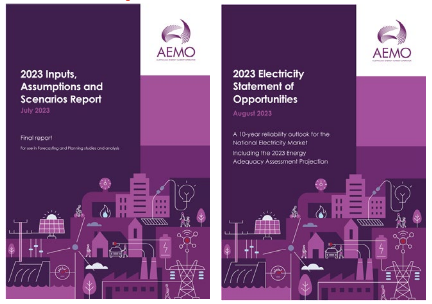
Our approach to assessing the benefits of Project Marinus consists of forecasting and comparing wholesale electricity prices with and without the Marinus cables in the NEM's electricity network

Inputs

IASR (2023)
(generation supply, planned retirements, policy constraints, build costs, gas prices), using the Step Change scenario, to resemble the unreleased AEMO ISP 2024 model.

Updated with AEMO's latest view
(demand)

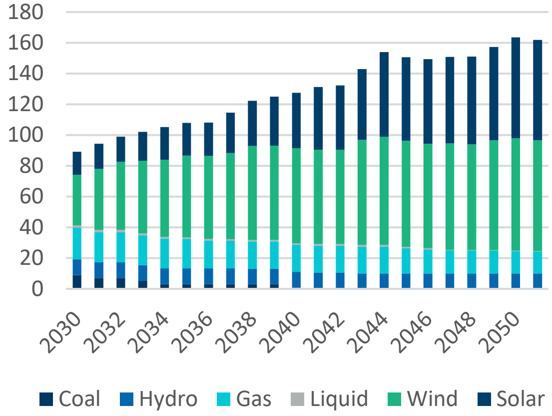
Combination of the 2023 IASR and ESOO (Aug 2023), reflecting AEMO's most up-to-date latest views[1]



Capacity Mix

Using our in-house power market model, calibrated using the 2023 IASR, **we estimate the baseline capacity mix for each region** needed to meet capacity requirements while minimising costs.

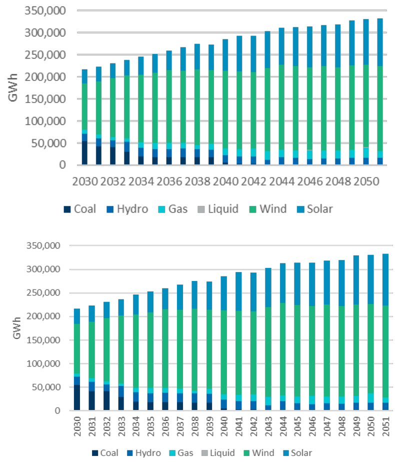
NEM Installed Capacity (GW)



Dispatch and wholesale electricity prices

Our model determines generation profile and prices on an hourly basis **using the baseline capacity mix as a starting point.[2]**

NEM Total Generation (GWh)



Without Project Marinus

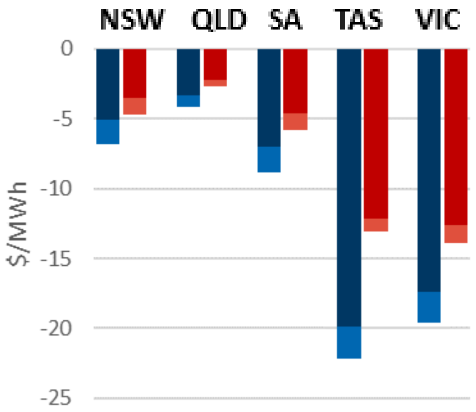
With Project Marinus

Price output

Impact on wholesale electricity prices equals **the difference between the prices observed** in a version of our model without Project Marinus…

…and a version with **either one or two Marinus cables** present in the NEM.

Average reduction in wholesale electricity prices

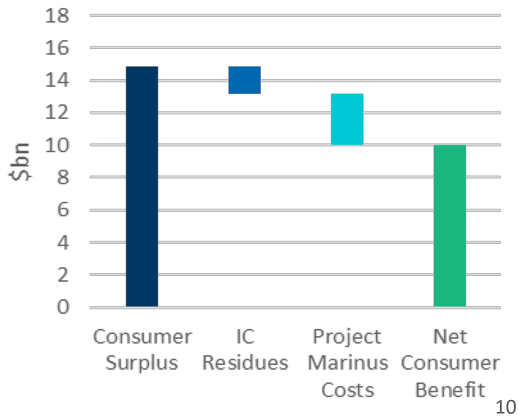


Benefits calculation

Overall consumer benefit assessed based on modelled change in prices and expected consumption profiles

…and combined with changes in network costs[3] and Project Marinus' own costs

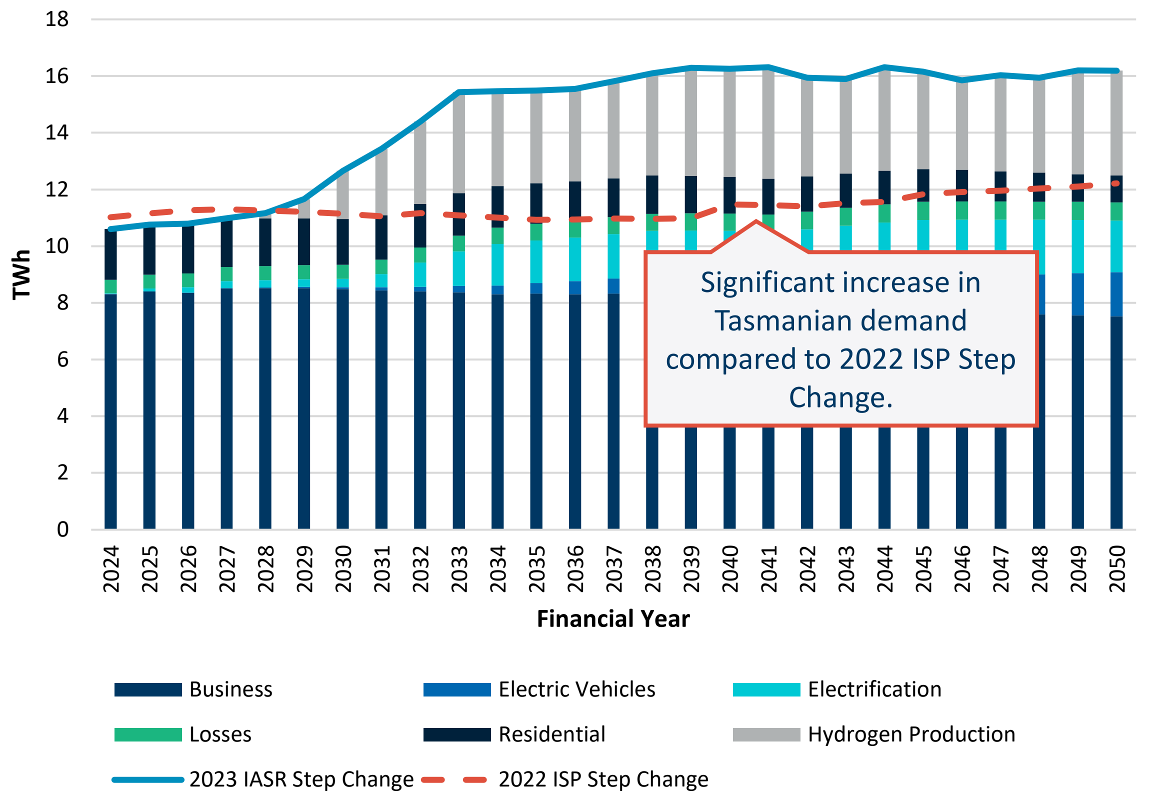
Consumer benefits calculation



(1) Draft 2024 ISP expected to published in December 2023, following the completion of these works. (2) See page 12 for more details. (3) We assume that any incremental changes in the rents earned by other interconnectors are passed through to consumer bills through network charges.

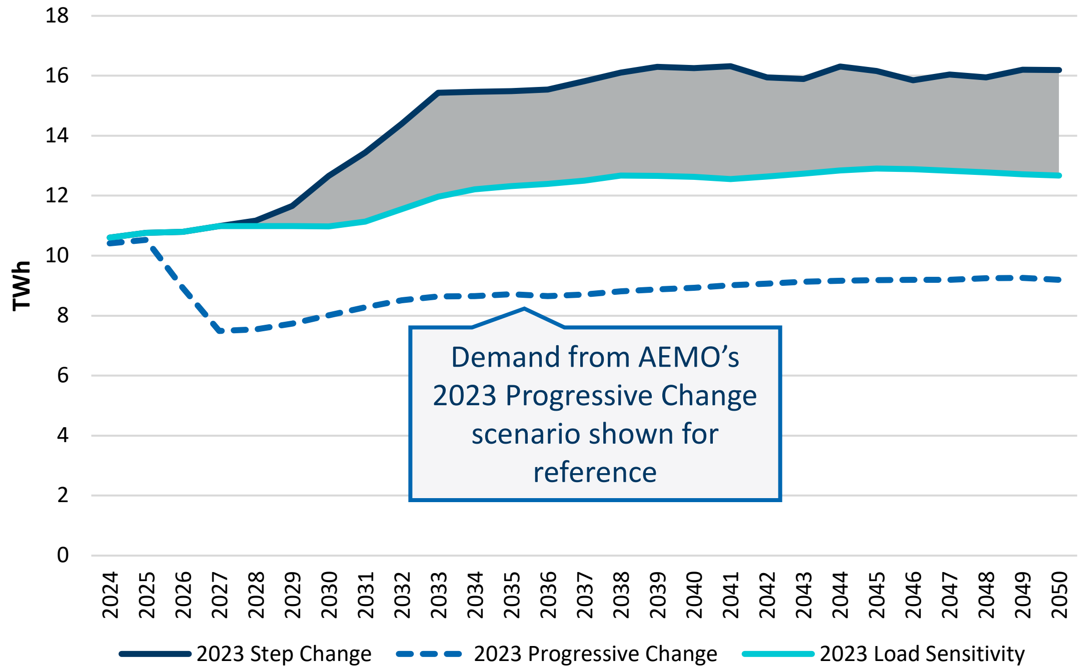
We have carried out our assessment across a range of demand outcomes given there is now material uncertainty around projected electricity demand in Tasmania across AEMO's forecasting scenarios

Expected Tasmanian Electricity Demand has increased substantially since 2022 ISP



- Compared to the 2022 ISP 'Step Change' scenario, AEMO's IASR 2023 'Step Change' scenario assumes a materially higher Tasmania electricity demand in 2050, increasing from c. 12 TWh in 2022 ISP to 16 TWh in 2023 IASR.
- A significant factor in this increase in demand can be attributed to **growth in demand for hydrogen production** expected under the 2023 IASR 'Step Change' scenario.

Our assessment covers a range of demand outcomes to reflect uncertainty



- AEMO's **2023 IASR reflects greater uncertainty in Tasmania electricity demand** going forward, with the 2023 IASR 'Progressive Change' scenario expecting less than 10 TWh of Tasmanian demand by 2050.
- As such, we have estimated price impacts and net benefits across a range of potential demand outcomes to account for uncertainty in AEMO's demand forecasts. We model AEMO's 2023 'Step Change' scenario and a 'Load Sensitivity' with reduced Tasmanian electricity demand.

We estimate a baseline capacity mix in line with AEMO's 2023 IASR Step Change scenario, adjusted for the absence of Project Marinus

Baseline NEM generation mix

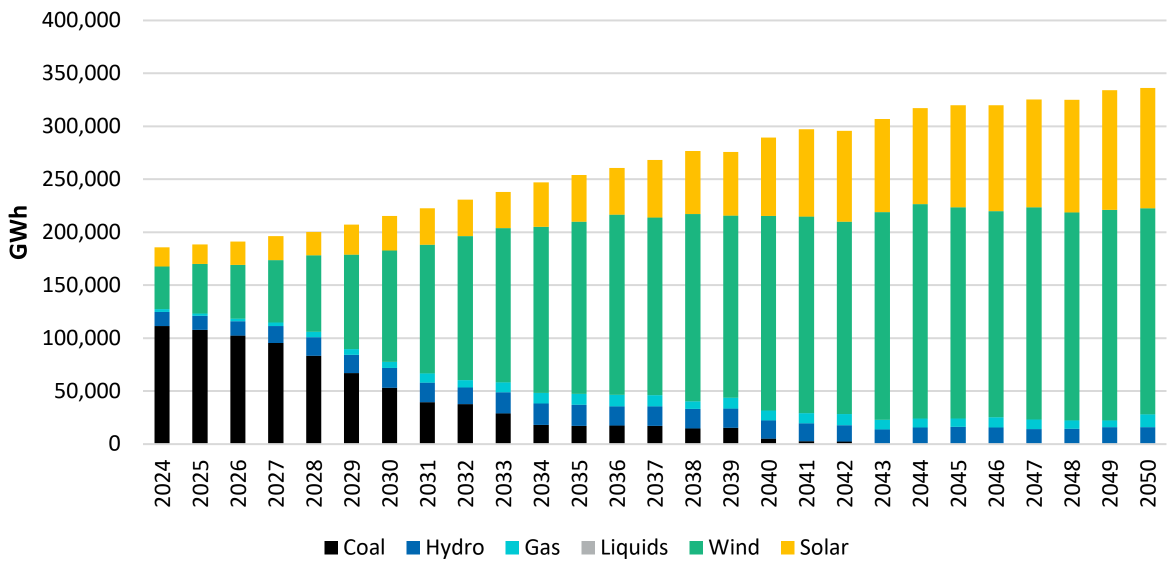
We establish a **baseline generation mix** (see graph below), that reflects the generation profile that we expect to be present in the NEM **in the absence of Project Marinus**.

To determine this baseline, we calibrate our in-house power market model of the NEM with AEMO's 2023 IASR assumptions (Step Change Scenario), assuming that:

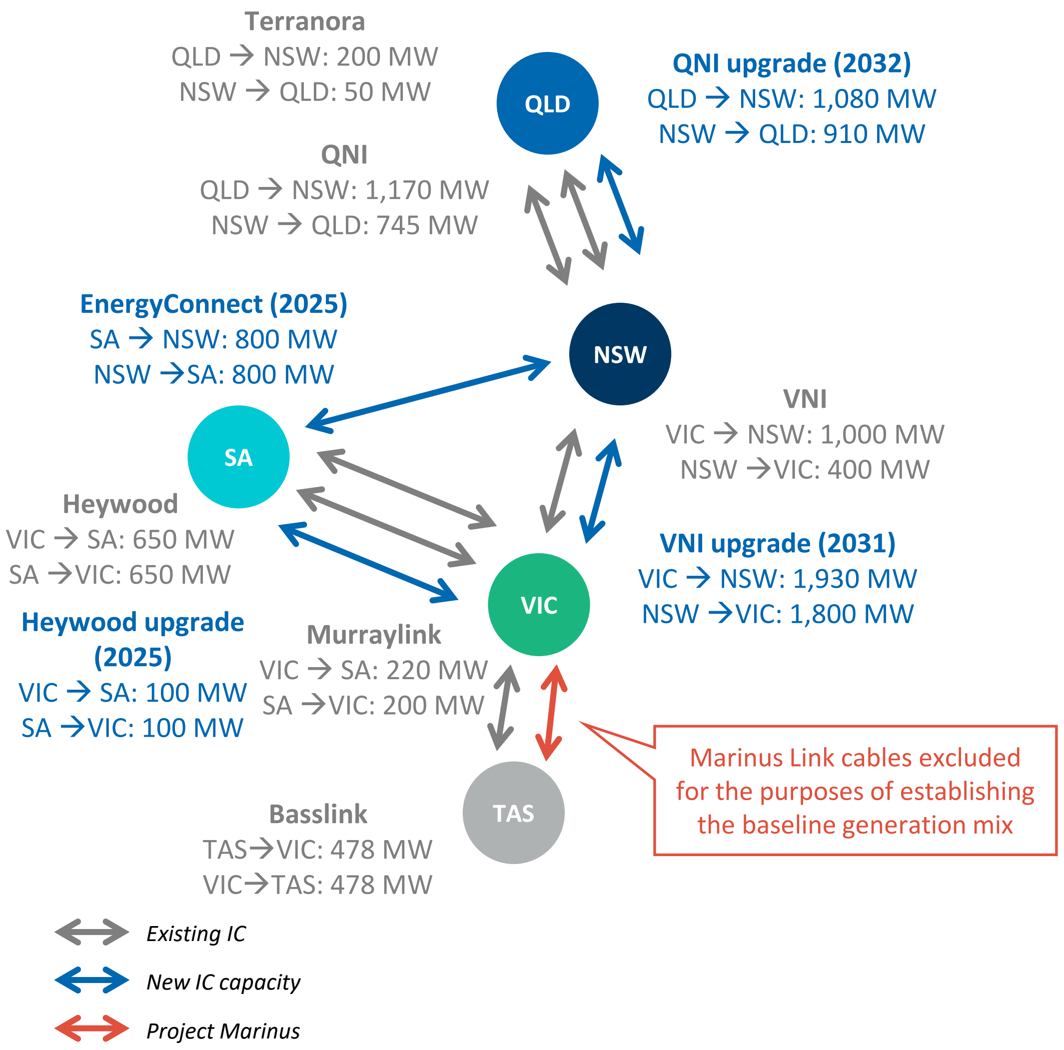
- price regions are connected according to the current and planned system of interconnectors (as shown on the right);
- this topology reflects all committed and anticipated transmission projects in the 2023 IASR, **but with Project Marinus excluded;**
- updating for the 2023 IASR to **also exclude planned Project Marinus-dependent generation investments** (see next page for more detail); and
- coal-fired generators are retired in line with AEMO's latest assumptions.

Removal of Project Marinus results in some key differences with the 2023 IASR Step Change Scenario in our Without Project Marinus counterfactual:

- **In Tasmania:** Less build-out **and** more curtailment of Tasmanian wind.
- **In Victoria:** More reliance on gas generation and imports from other states to serve demand.



Assumed NEM topology[1, 2]



(1) AEMO, *2023 Inputs Assumptions and Scenarios Report*, July 2023 (link), pages 140-148 (2) Figures displayed for IC capacity are for Winter Reference.

We add Project Marinus-dependent capacity to Tasmania in our modelling runs with Project Marinus in operation in order to assess the impact of the renewables that Project Marinus is expected to support

Tasmania Hydro Upgrades

Total Hydro capacity = 390 MW

West Coast (100 MW)
Tarraleah (150 MW)
Gordon (90 MW)
Non-scheduled (50 MW)

- According to AEMO, Project Marinus is expected to unlock investments to redevelop or upgrade capacity of existing Hydro assets in Tasmania.[1]
- These investments are expected to result in a total of **390 MW** of additional Tasmanian Hydro capacity.
- We assume that these Hydro upgrades are made with **either one or two** Marinus Links operational.

Two Marinus Link Cables

Hydro upgrades (390 MW)
Wind (600 MW)
Pumped Hydro (750 MW)

- With two Marinus Link cables, we assume that TRET is met given the additional export capacity that Project Marinus provides.
- For the purposes of our modelling, we assume that this means generation of **21 TWh** of renewable generation by **2040.**[2]
- We estimate that meeting the TRET requires 600 MW of additional wind capacity to be built in Tasmania by 2040.[3]

One Marinus Link Cable

Hydro upgrades (390 MW)
Wind (300 MW)

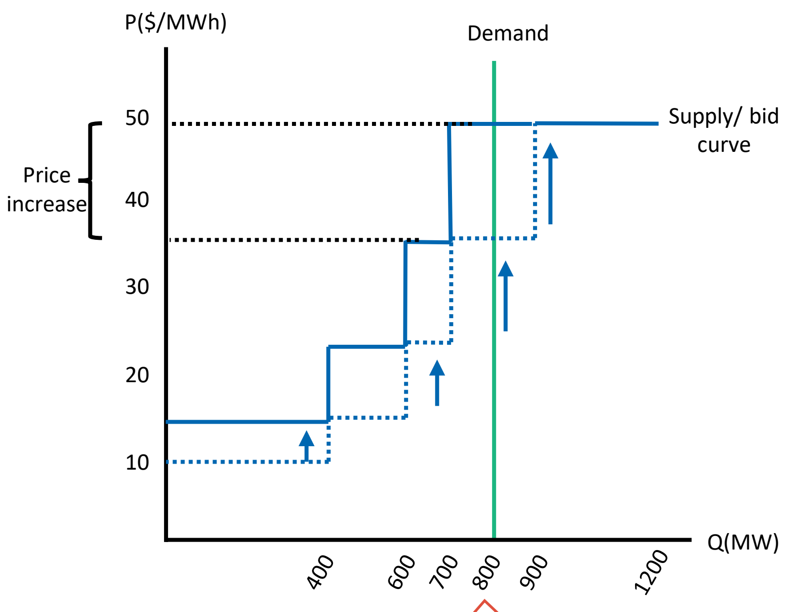
- With only one Marinus Link cable, we assume that Tasmanian wind capacity build is 300 MW – half of the capacity built with two cables.
- In addition, we assume that 750 MW of pumped hydro storage under the Battery of the Nation project is not constructed due to the reduced export capacity provided by Project Marinus compared to with two Marinus Link cables.

(1) See 2023 IASR Workbook, notes on Flow Path Augmentation Options sheet: *"With the introduction of Marinus link, the capacities of the following generators increase by: 100 MW across the west coast, 150 MW for Tarraleah and 90 MW capacity for Gordon."* (2) Including both grid-scale and rooftop PV - see 2023 IASR Workbook, Energy Policy Targets sheet. (3) Relative to AEMO's 2022 ISP Step Change 'counterfactual'. For more information see AEMO, *2022 Integrated System Plan*, June 2022 (link) – *Part C.*

We use Bertrand pricing and other simplifying assumptions to compute prevailing wholesale electricity prices

Generator bidding behaviour

- For the purposes of our modelling, we assume Bertrand pricing as an approximation for generating bidding behaviour, in line with our previous analyses.
- Bertrand pricing assumes that, over time, all generators have developed an understanding of their position of the merit order, and therefore increase their bid to marginally below the marginal cost of the next cheapest generator (rather than bidding at their own marginal cost, as is often assumed).
- Bertrand pricing therefore ensures that the dispatch respects the merit order of generator costs (thereby minimising system costs), while introducing an element of rational profit maximising behaviour from market participants.
- An alternative assumption could be that generators bid according to some measure of their own costs, such as Short Run Marginal Cost (“SRMC”), Long Run Marginal Cost (“LRMC”) or other variants.
- Previous FTI analysis has indicated that, while no one assumption fully captures the bidding behaviour of market participants, Bertrand pricing resulted in a closer approximation of historical prices compared to SRMC or LRMC-based approaches.
- In the last years of the modelling period, we revert to SRMC-based bidding behaviour to avoid unrealistic Bertrand-based bidding outcomes that result from the system being almost exclusively VRE generation, hydro and storage and the aggregated treatment of new entrant generation units within the model.



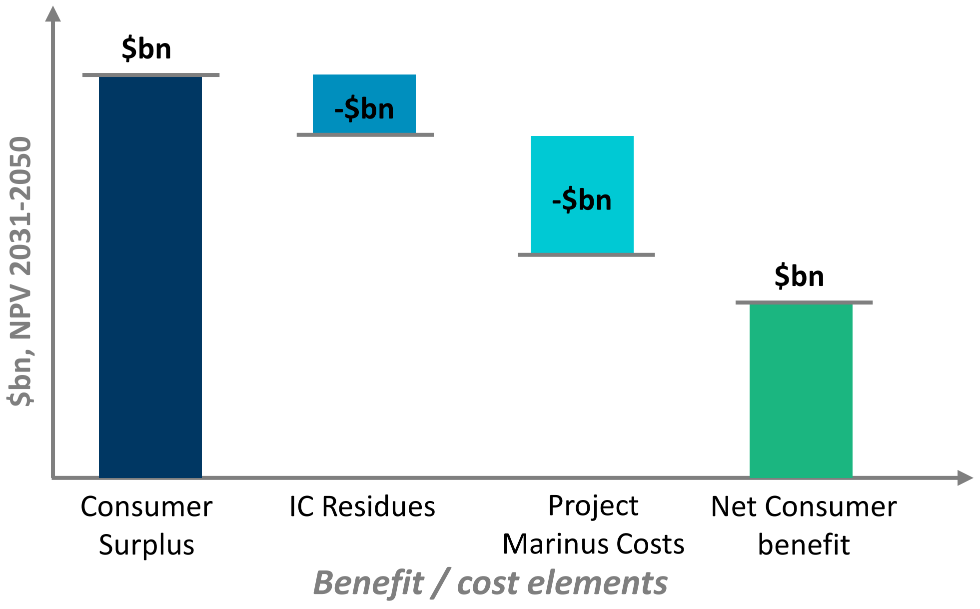
In this stylised example, Bertrand pricing results in the marginal generator bidding at $49.99/MWh (rather than $35/MWh). This means that 800 MW is now filled at $49.99 rather than at $35.

Tasmanian Pricing: Regulatory Instrument

- The prices that consumers pay for electricity in Tasmania are governed by long-term contractual arrangements between retailers and Hydro Tasmania. The methodology for calculating prices is derived from a ‘rules-based’ methodology outlined in the Wholesale Contract Regulatory Instrument.
- As a result of these arrangements, the price that consumers in Tasmania pay for electricity (the ‘Tasmania contract price’) would not be accurately reflected by the Tasmania spot price calculated in our power market model (either with or without the assumptions set out to the left).
- Instead, we make a simplifying assumption to estimate the Tasmania contract price:
  - We assume that the Tasmania contract price is equal to the Vic spot price as calculated in our power market model.
  - This is in line with the assumption made in our 2020 modelling, where, based on discussions with both Hydro Tasmania and the Tasmanian Government, it was agreed that the Victoria spot price would be a useful proxy for the Tasmania contract price. We have assumed that this assumption is still reasonable up to 2050.
  - No further adjustments are applied to account for other relevant elements of the Regulatory Instrument that may affect prices. Analysis of data from our 2020 work confirmed that the impact of such adjustments are likely to be immaterial or non-systematic in nature.

In line with the methodology used in our previous reports, our assessment of the net benefits of Project Marinus uses a consumer-focused approach

Cost-benefit analysis: illustration of the methodology



A pure economic approach calls for **total welfare analysis**…
…however, in this analysis we have only considered a more **consumer-focused welfare analysis**.

Specifically, we find the **Net Consumer benefit** of Project Marinus, which (unlike the **Net Societal benefit**) does not consider the impact on producer surplus arising from changes in wholesale electricity prices.

The change in consumer surplus considers the quantum of benefit accruing to consumers from lower wholesale electricity prices. This is then netted off against the change in interconnector residues ("IC residues")[1] and Project Marinus costs, which we assume Transmission Network Service Providers ("TNSPs") pass on to consumers through network charges.

- Our assessment of net consumer benefits follows the same framework as our 2020 report. Where appropriate, we have updated parameters and assumptions to be in-line with AEMO's latest methodologies or to align with changes in the NEM.
- We model the period **2031 to 2050** for each region and NEM-wide.
- We use a single discount rate of **7.0%** (real, consistent with AEMO's 2023 IASR Central assumption)[2] to calculate the present value of costs and benefits.
- IC residues represent the net impact on residues earned by interconnectors. We assume that these residues are allocated to different states on the basis of interconnector flows.[3] They are included because the introduction of Project Marinus is expected to change wholesale prices and flows between each region which in turn impact the amount of interconnector costs that are recovered from consumers. A single interconnector loss factor of **2.18%** is used to calculate IC rents across all lines.[4]
- Project Marinus costs includes forecast annuitised capex and annual opex across our modelling period (2031 to 2050) for both Marinus Link and NWTD Project.
  - For Marinus Link, forecast capex costs and annual opex costs are based on indicative cost estimates provided by TasNetworks, assuming a 40-year project life.
  - Costs for NWTD are forecast capex costs based on indicative cost estimates provided by TasNetworks.
- Costs and benefits incurred after 2050 are excluded from the analysis.[5]

(1) IC residues refers to the rents earned by interconnectors across the NEM transmission network, which are returned to consumers. (2) AEMO, *2023 IASR Assumptions Workbook*, August 2023 (link). (3) In line with methodology set out by AEMO for the Settlements Residue Auctions (link). (4) In our 2020 report, our calculation of IC residues excluded Basslink, which was treated as an unregulated interconnector that did not pass residues back to consumers. We assume that Basslink operates as a regulated interconnector over the modelling period and so we now include it within the calculation of IC Residues. (5) In our analysis, we assume that the costs of the additional Tasmanian generation and pumped hydro capacity facilitated by Project Marinus would be recovered through wholesale prices without any need for further subsidies or other funding mechanisms to be implemented.

Results – Pricing outcomes and cost benefit analysis

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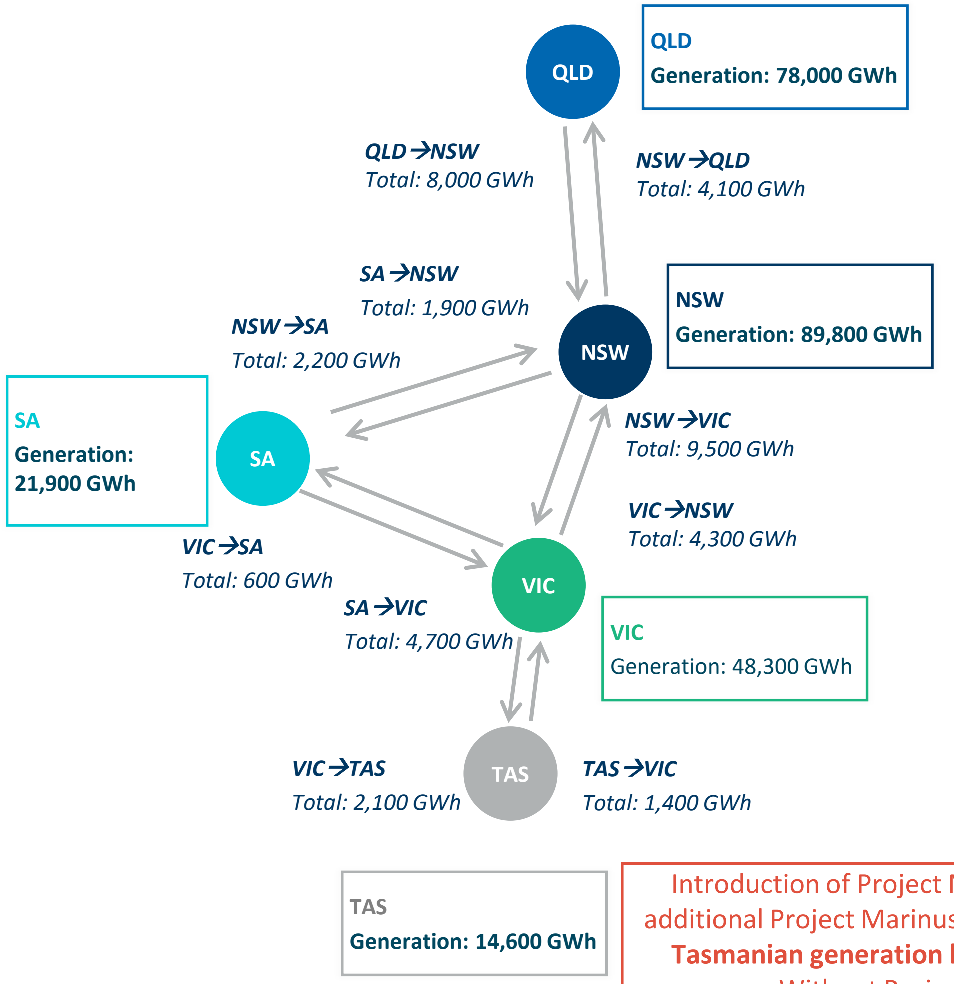
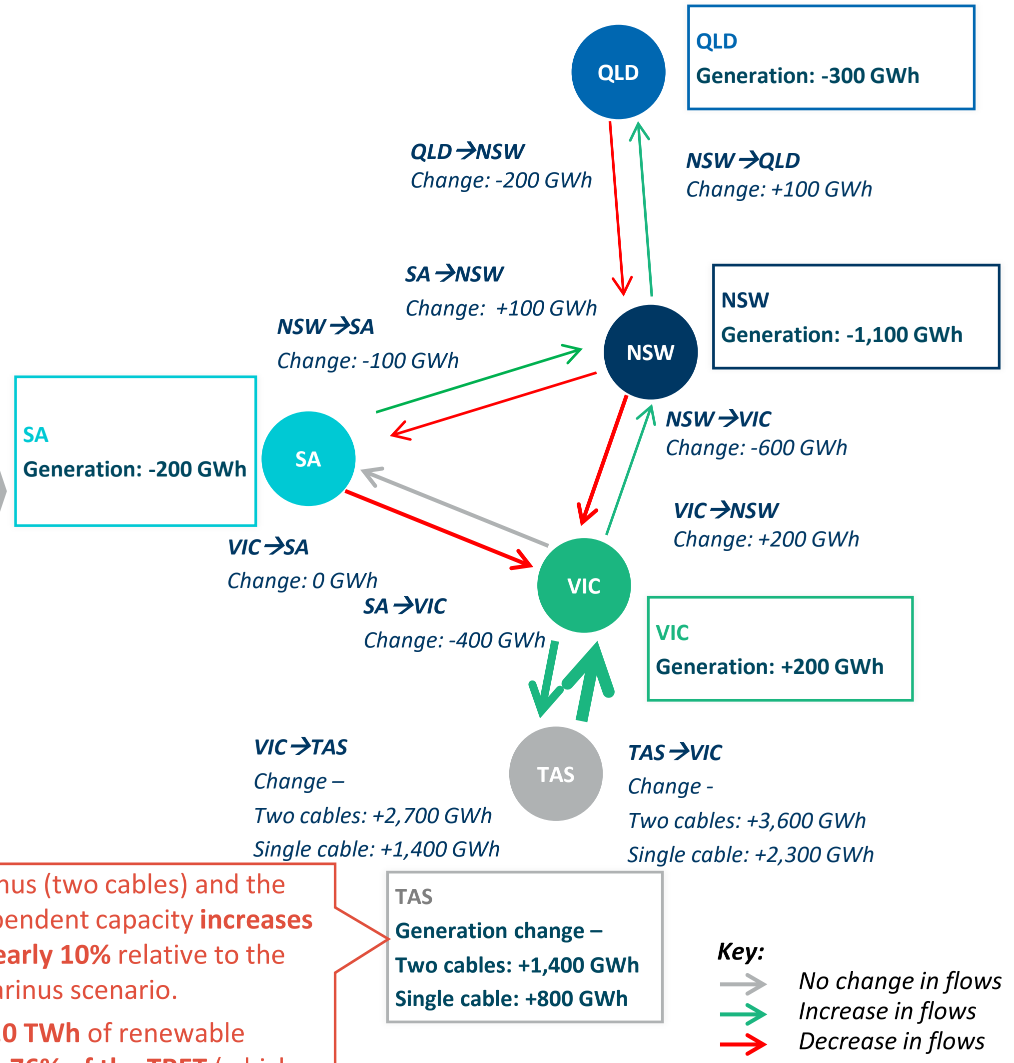
Introducing Project Marinus unlocks large volumes of renewable generation in Tasmania that would otherwise be constrained, which flows to the mainland NEM

- **In the absence of Project Marinus, Basslink**, the sole link between Tasmania and the mainland NEM, **is frequently fully utilised**. Our modelling indicates that Basslink's maximum capacity constrains exports from Tasmania in 83% of all periods modelled[1] from 2031-2050, in the absence of Project Marinus.
- During these periods, **additional Tasmanian capacity, which could help to meet demand on the mainland, is prevented from generating** by this constraint.
- Additionally, in the long run, this constraint on the ability of Tasmanian capacity to generate may potentially **weaken the commercial incentives to invest in new generation capacity in Tasmania**, such as new wind farms or Battery of the Nation. This, in turn, could threaten the ability of Tasmania to meet TRET.
- **Introducing Project Marinus reduces this constraint** which, paired with the Project Marinus-dependent capacity additions, allows large volumes of Tasmanian renewable generation to flow into the mainland NEM. For example, over calendar 2035, we estimate that **Tasmania to Victoria flows increase by 3.6 TWh as a result of a two cable Marinus.**
- In 2035, the Tasmanian renewable generation helps displace **nearly 2.5 TWh** of gas generation.[4]

NEM topology, Without Project Marinus, 2035



NEM topology, With Project Marinus (two cables), FY 2035[2]



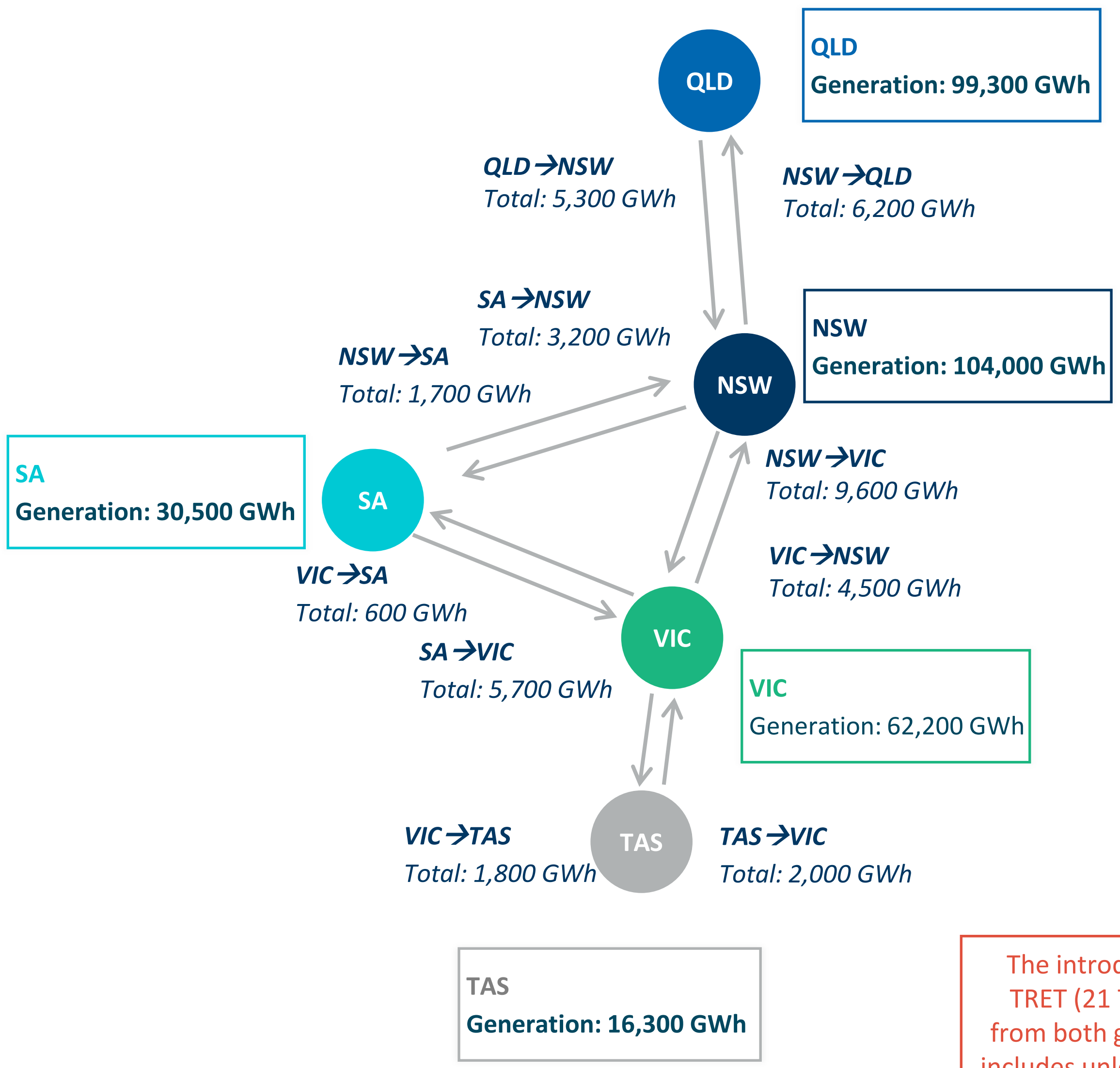
Introduction of Project Marinus (two cables) and the additional Project Marinus-dependent capacity **increases Tasmanian generation by nearly 10%** relative to the Without Project Marinus scenario.

This gets Tasmania to **16.0 TWh** of renewable generation, which represents **76% of the TRET** (which requires 21 TWh of renewable generation by 2040).[3]

(1) We model hourly intervals. (2) All results are for two cables unless otherwise specified. (3) The TRET was announced in 2020 and is a legislated target such that renewables meet 200% of Tasmania's 2022 electricity needs by 2040. This equates to a renewables generation target for Tasmania of 21 TWh in 2040. See *The Draft Tasmanian Renewable Action Plan 2020* (link), page 4. (4) For further detail, see *Change in NEM generation when Project Marinus is introduced* chart on page 20.

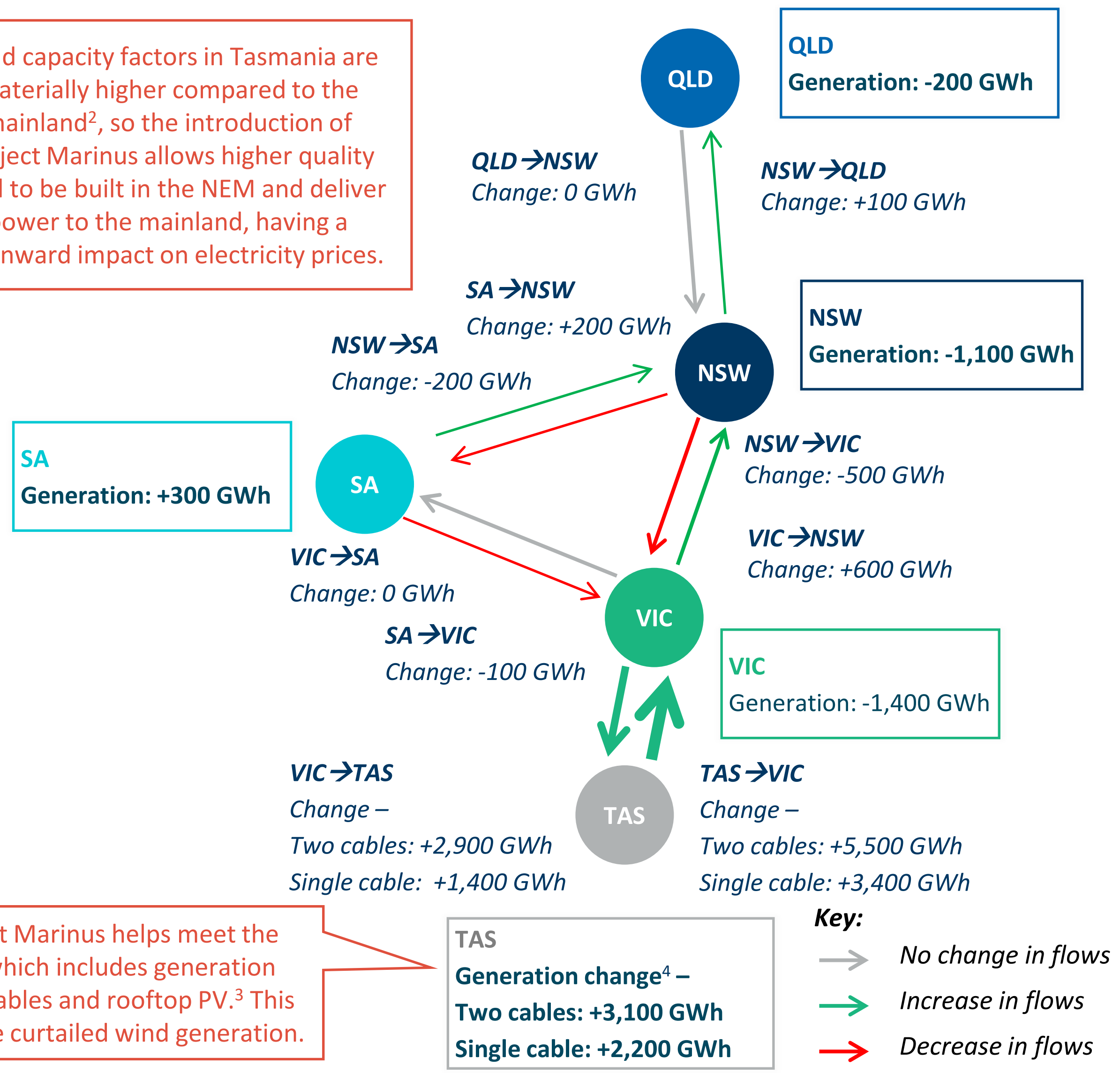
Introducing Project Marinus unlocks large volumes of renewable generation in Tasmania that would otherwise be constrained, which flows to the mainland NEM

NEM topology, Without Project Marinus, 2045



NEM topology, With Project Marinus (two cables), 2045[1]

Wind capacity factors in Tasmania are materially higher compared to the mainland[2], so the introduction of Project Marinus allows higher quality wind to be built in the NEM and deliver power to the mainland, having a downward impact on electricity prices.

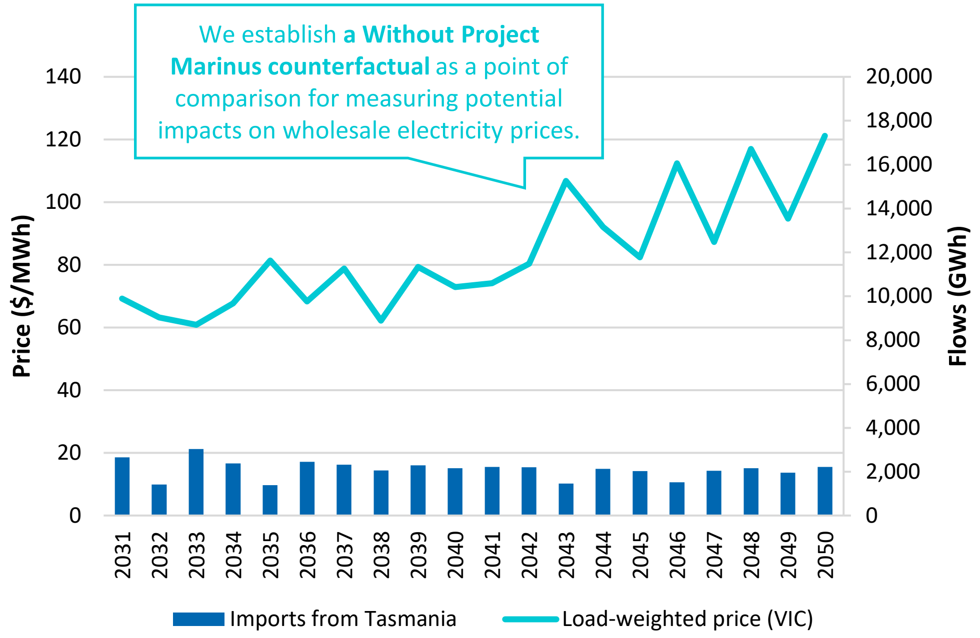


The introduction of Project Marinus helps meet the TRET (21 TWh by 2040), which includes generation from both grid-scale renewables and rooftop PV.[3] This includes unlocking otherwise curtailed wind generation.

(1) All results are for two cables unless otherwise specified. (2) AEMO, *2023 IASR Assumptions Workbook*, August 2023 (link). (3) 2023 IASR estimates c. 1.2 TWh output in 2040, which contributes to meeting TRET in combination with generation shown in chart above. (4) Net generation change due to Project Marinus is +700 GWh in 2045 due to overall additional losses introduced into the system from both interconnectors and storage assets. The change in losses in the system may differ from year to year and could be both net positive or net negative.

Project Marinus results in increased flows from Tasmania to Victoria, which aligns with a downward effect on wholesale electricity prices in Victoria

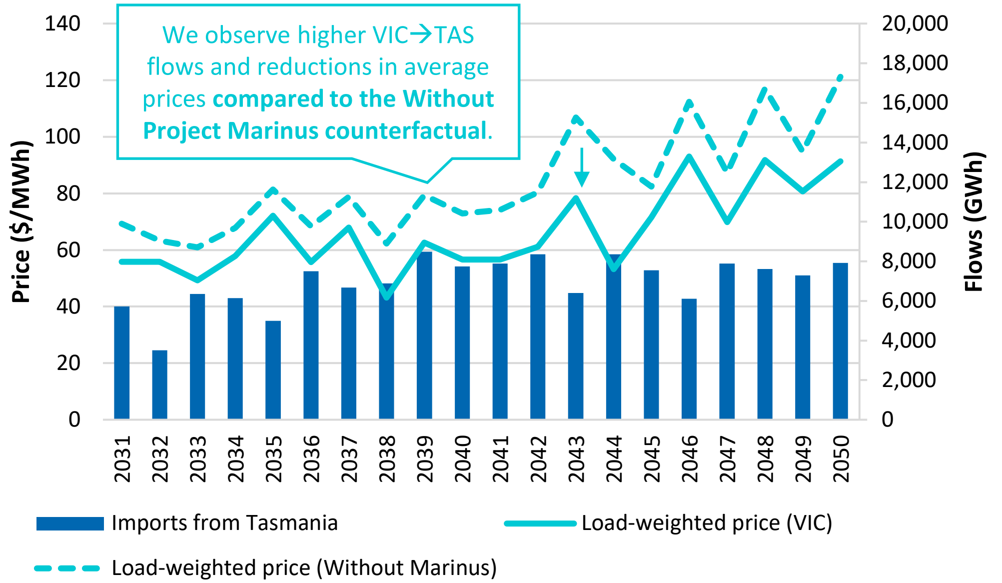
Prices ($/MWh) and Imports from Tasmania to Victoria, Without Project Marinus



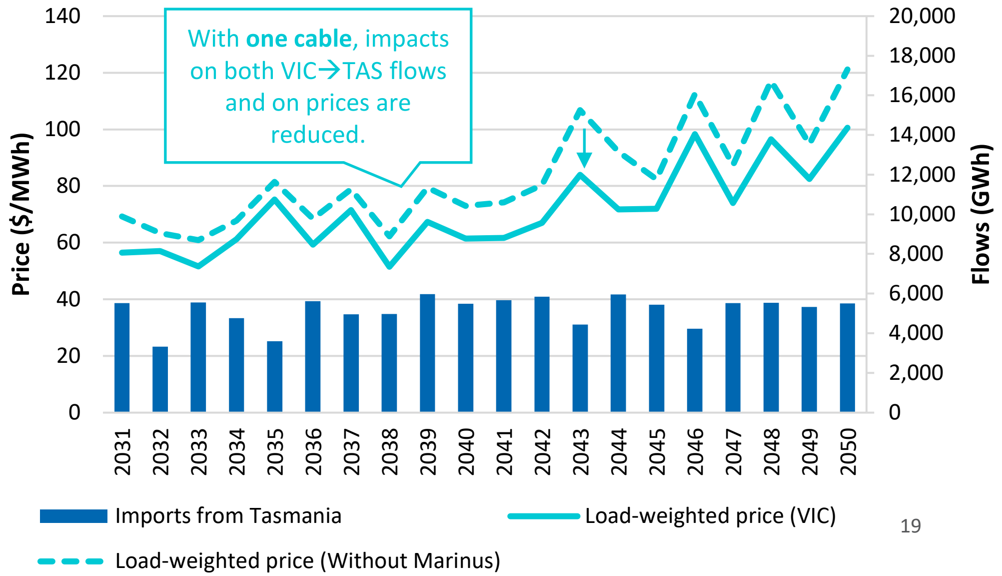
- As mentioned previously, **in the absence of Project Marinus, Basslink** is the sole link between Tasmania and Victoria.
- For Victoria, this means that there is limited capacity to import electricity from Tasmania. Our modelling indicates that **in the absence of Project Marinus**, interconnector flows from Tasmania to Victoria average **2.1 TWh per annum**.
- Over the period 2031 to 2050, our modelling indicates average load-weighted prices in Victoria of **$83/MWh.**
- Our modelling indicates prices trending upwards over time, reaching an average of **$107/MWh** in the last five years of the modelling period, compared to **$69/MWh** in the first five years.
- This serves as our **Without Project Marinus counterfactual**, against which we measure the potential impact of Project Marinus (both two cables and one cable).

Prices ($/MWh) and Imports from Tasmania to Victoria, With Project Marinus

- With the introduction of Project Marinus, the capacity to import electricity from Tasmania to Victoria increases.
- We can observe the effect of this increased capacity in our modelling of the NEM **With Project Marinus (two cables),** where interconnector flows from Tasmania to Victoria average **7.0 TWh per annum.**
- Increased flows from Tasmania to Victoria are aligned with lower average prices in Victoria of **$66/MWh** across the period – a fall in average prices of **$17/MWh compared to the Without Project Marinus counterfactual.**



- For **one cable**, capacity to import from Tasmania to Victoria is reduced compared to **two cables.**
- This impacts the levels of imports we observe in our modelling, with average flows of **5.2 TWh per annum**.
- This is still, however, a material increase in imports from Tasmania to Victoria **compared to the Without Project Marinus counterfactual.**
- Consequently, average prices across the period are still expected to fall by around **$13/MWh** compared to the Without Project Marinus counterfactual.

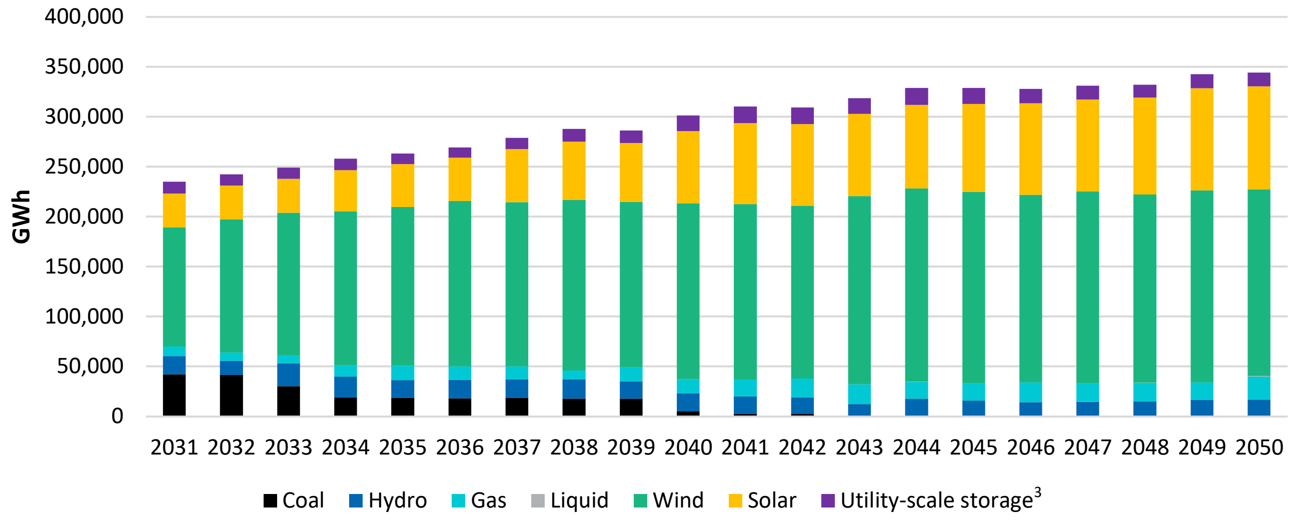


With coal retirements forecast until 2043, introducing Project Marinus and dependent capacity helps firm up supply whilst allowing more displacement of thermal gas generation with lower cost renewables

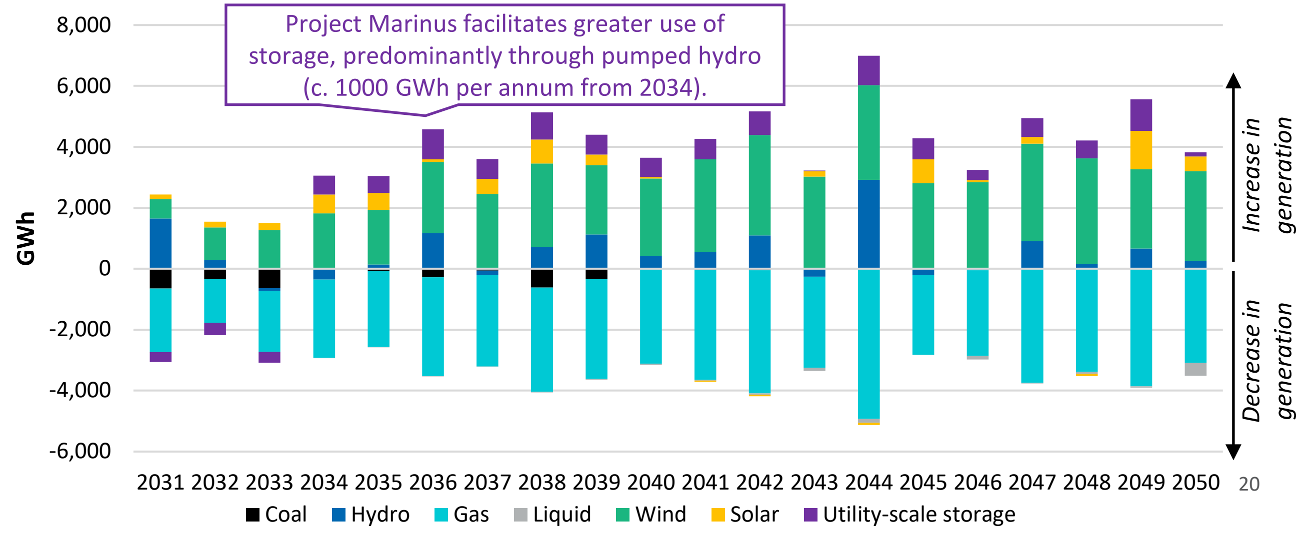
The impact of Project Marinus on NEM generation[1]

- **In the Without Project Marinus counterfactual**, gas generators are increasingly used to cover periods of relatively low renewable generation, as coal plants are retired and NEM-wide demand increases.
  - In these instances, costlier gas generators are increasingly the marginal bidders, increasing electricity prices across NEM regions.
  - Annual coal generation reduces from a level of **54 TWh per annum** in 2030, before being retired by 2043. Over the same period, gas generation increases by 135% from **8.4 TWh** to **19.8 TWh**.
- Project Marinus facilitates the entry of large volumes of Tasmanian generation into the NEM.
  - From 2033 onwards, with Project Marinus, wind generation is expected to increase, on average, by **2.6 TWh** a year, while hydro generation increases by **0.5 TWh** a year.
  - In addition to the Project Marinus-dependent wind capacity, the added export capacity of the Marinus Link cable(s) enables **reduced curtailment in Tasmanian wind** that would have been built even in the absence of Project Marinus to contribute towards the TRET.
- This has a noticeable impact on NEM-wide gas generation, as the additional interconnection capacity, combined with the additional storage capacity of Battery of the Nation, enables lower-cost renewables in Tasmania to cover periods of low renewable generation on the mainland.
  - Tasmanian wind has a high capacity factor relative to mainland wind and solar and is not strongly correlated with mainland wind generation. This complementary profile increases the share of demand that low-cost renewable generation can meet.[2]
  - The marginal gas peaking plants are significantly displaced when both Marinus Link cables are operational, with a **decrease in gas generation between 2 TWh to 5 TWh** each year from 2033 to 2050 relative to the Without Project Marinus counterfactual.
- As discussed on page 8, coal generation is expected to be phased out more rapidly than was assumed during our 2020 analysis. As such, more reliance is placed on relatively high-cost gas and less on relatively lower cost coal in our 2022 analysis.
- As such, **we now find that introducing Project Marinus and additional Project Marinus-dependent capacity displaces significantly more gas generation than in 2020** (an average of 4.1 TWh a year from 2031 to 2040 vs 2.4 TWh in 2020), and less coal.

NEM generation without Project Marinus



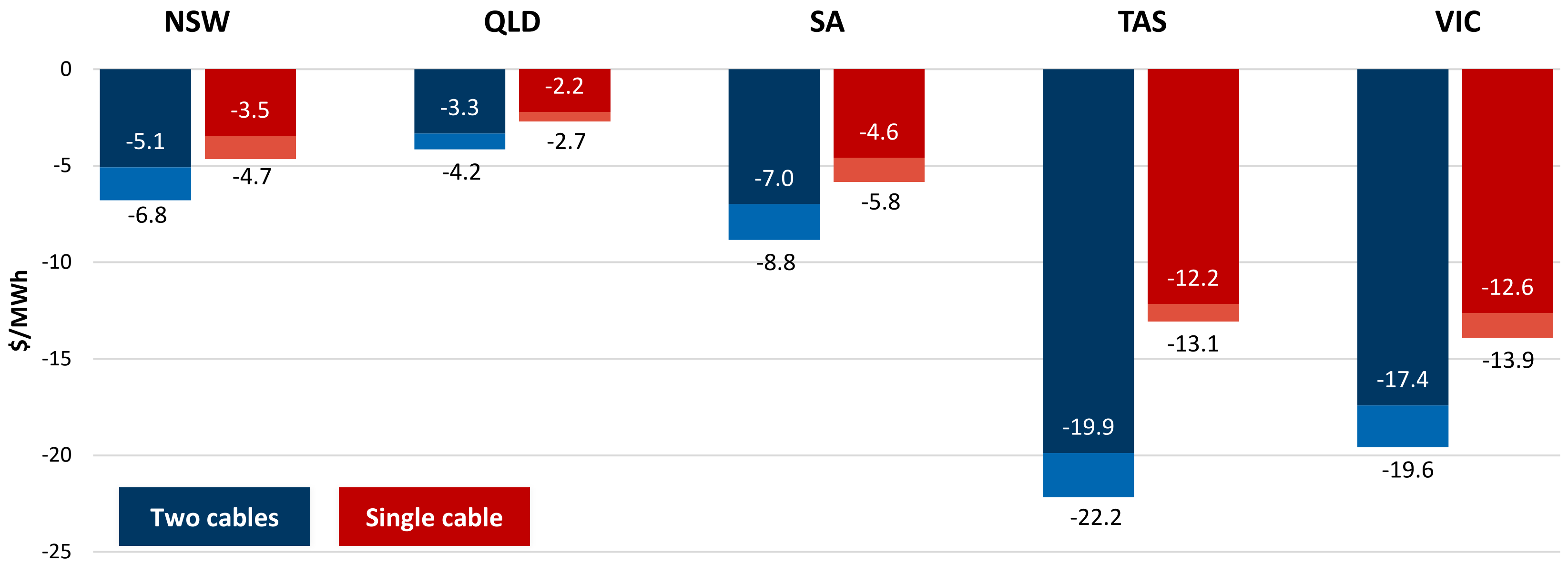
Change in NEM generation when Project Marinus is introduced



(1) All figures are for two cables unless otherwise specified. (2) Australian Energy Council, *Integrating Renewables: An assessment of Generation Correlation*, 27 September 2019 (link). (3) Utility-scale storage includes both grid-scale batteries and closed-loop pumped hydro (excludes pumped hydro with inflows). The chart presents discharge for storage assets. Charging of storage is excluded from the chart.

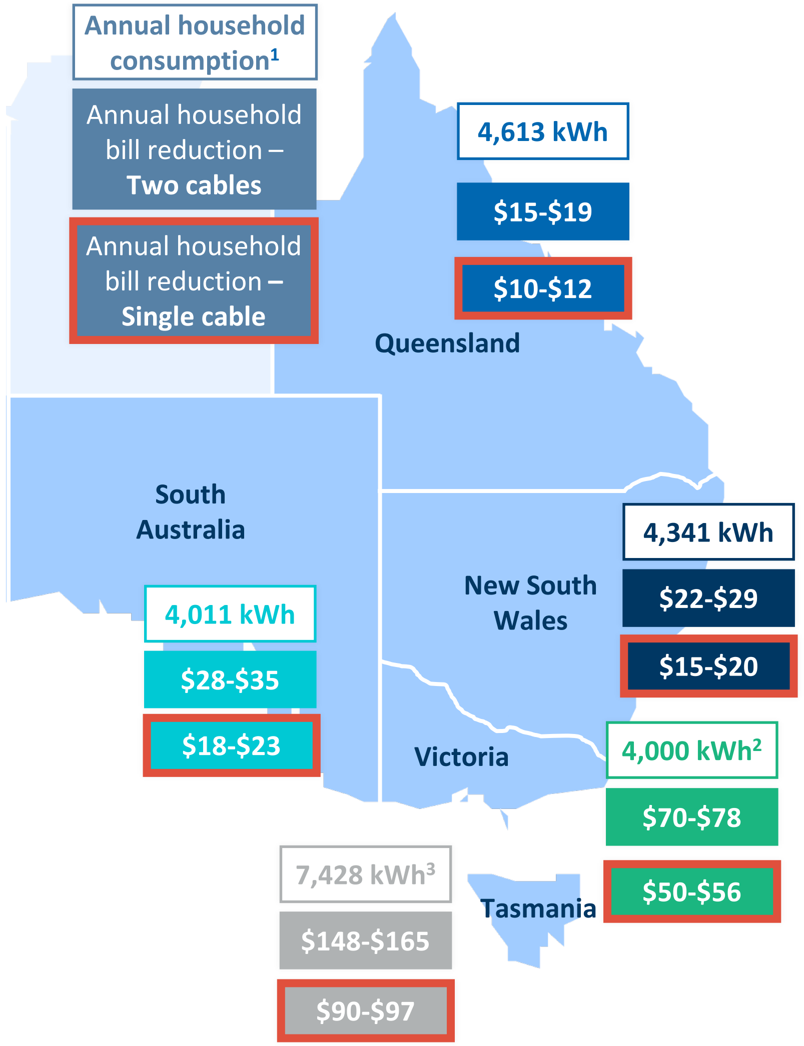
Our modelling once again indicates that Project Marinus is expected to lower average electricity prices across the NEM, with the impact being most significant in Tasmania and Victoria

Average reduction in wholesale prices, 2031-2050 (2023 dollars)



- The average expected reduction in wholesale prices is **$20 to $22/MWh for Tasmania** and **$17 to $20/MWh for Victoria** across the period 2031-50.
- In the event that only the first Marinus Link cable is constructed, the effect on prices reduces to **$12 to $13/MWh for Tasmania** and **$13 to $14/MWh in Victoria.**
- Lower electricity prices **feed directly into the wholesale energy element of consumer bills**. For **two cables**:
  - **Tasmanian consumers** expected to experience the highest savings of **$148 to $165** per household per year, driven by the relatively high level of household consumption and change in price. This falls to **$90 to $97** for one cable.
  - **Victorian consumers** experience a similar level of price change, but a lower household saving of **$70 to $78** due to lower levels of average household consumption. This falls to **$50 to $56** for one cable.
  - **In other states**, the average reductions range from **$15 to $35** per household.
- These savings are comparable to our previous work from 2022: **$111 for Tasmania** and **$72 for Victoria** in 2021 dollars (Note that this assessment looked at the average impact over a different period: 2029 to 2040).

Household bill impact of reduced wholesale prices



(1) For Queensland, South Australia and NSW: Australian Energy Regulator, *Default market offer prices 2023-24 – Final Determination,* Cost assessment model, May 2023 (link). 'Residential without CL' figures used. Customer-weighted average for NSW companies (2) Essential Services Commission, *Victorian Default Offer 2023-24: Final Decision,* May 2023, page 1 (link) (3) Office of the Tasmania Economic Regulator, *Typical Electricity Customers in Tasmania – 2022*, September 2022, page 2 (link)

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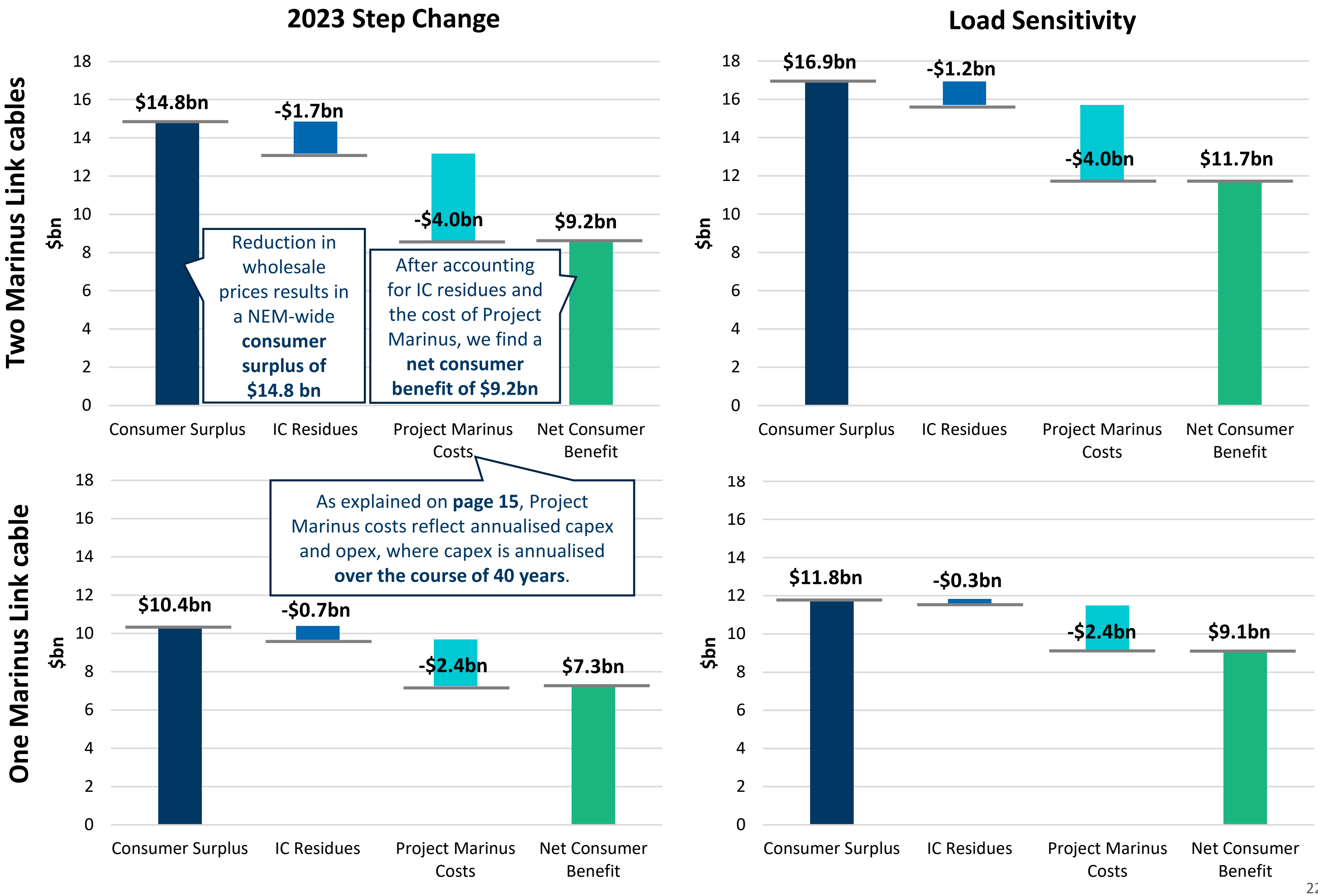
Our work indicates that the benefits of Project Marinus significantly outweigh the costs to consumers, resulting in net benefit of $7.3 billion to $11.7 billion from 2031 to 2050

- Our net benefits analysis[1] indicates that, with **two cables**, Project Marinus is expected to generate **net benefits of $9.2bn to $11.7bn for NEM consumers** in net present value terms.
- If only one Marinus Link cable is constructed, these net benefits are expected to fall to **$7.3bn to $9.1bn**.
- For both single cable and two cables cases, **benefits are higher under our Load Sensitivity scenario** where Tasmanian demand is lower.[2]
  - Lower demand in Tasmania facilitates greater flows from Tasmania to Victoria: our modelling indicates increases of **17%** and **16%** for single cable and two cables respectively.
  - Therefore, in the event that Tasmanian demand does not reach the levels expected under the 2023 IASR Step Change scenario, Project Marinus may be expected to generate greater net benefits across the NEM.
- This compares with estimated net benefits of **$5.4bn** for two cables from our 2020 report (in 2020 dollars). The net benefits have increased in the current modelling, driven by a number of factors:
  - faster exit of coal fired generation and faster uptake of renewables increases the demand for Tasmania renewable generations and the value of firming provided by Tasmania hydro and pumped hydro.
  - Capacity factors for Tasmanian wind generation have increased relative to the 2020 ISP.[3]
  - Fuel prices have increased, reflecting changing market conditions and inflation.

Net consumer impact of Project Marinus, $bn, Present Value 2031-2050 (2023 dollars)[4]



(1) The net benefits analysis set out on this slide has been updated with revised Project Marinus cost estimates (as of November 2024), provided by Marinus Link. For avoidance of doubt, such changes to Project Marinus costs do not affect our electricity price modelling, so no updates were made to our modelling as a result. (2) Demand is lower across the NEM in our Load Sensitivity scenario, but the reduction in Tasmania is greater than, on average, across the rest of the NEM. This is in line with expected demand in 2023 IASR Progressive Change Scenario, on which our assumptions for the Load Sensitivity scenario builds on. (3) AEMO, *2023 IASR Assumptions Workbook*, August 2023 (link). (4) Figures shown may not sum exactly due to rounding.

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