

NSW Network Infrastructure Strategy – Appendices

Appendix A: Key results of the economic analysis
for network infrastructure

May 2023

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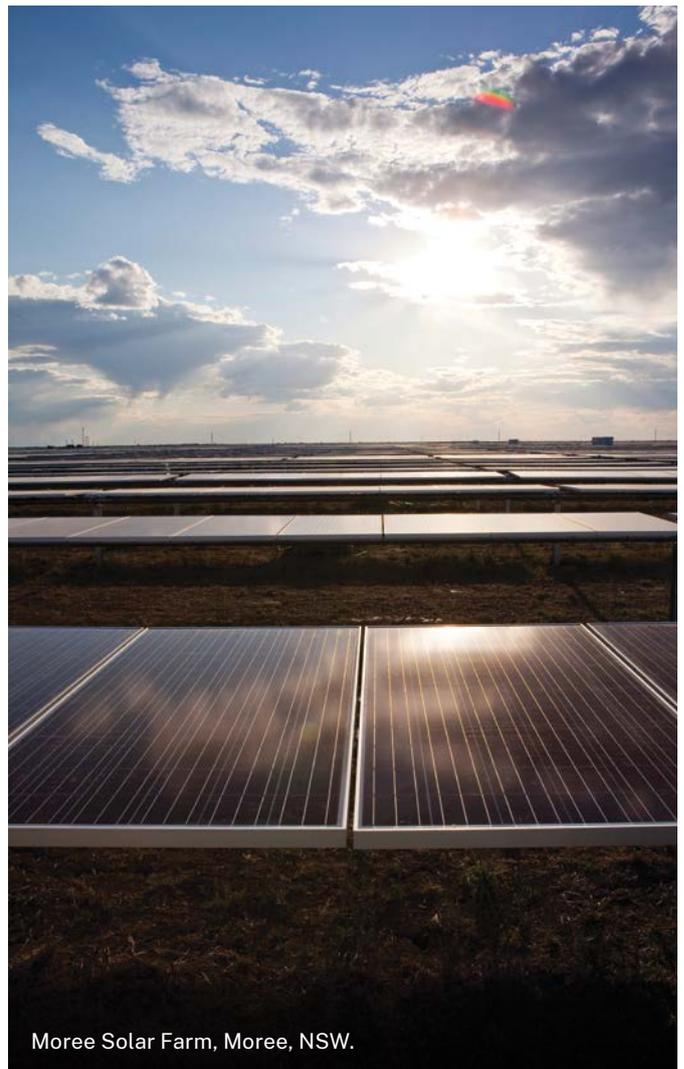
Overview

The Consumer Trustee has undertaken economic analysis to inform the Final Network Infrastructure Strategy (NIS) and the Draft 2023 Infrastructure Investment Objectives Report (Draft IIO Report).

When assessing the economic analysis, EnergyCo considered the results across the *Central*, *Transmission Delay* and *Coal Exit by 2030 and Strong Electrification* scenarios. As noted in the main report, EnergyCo did not consider the fourth scenario modelled for the NIS, the *Early Coal Exit* scenario, because its outcomes were not sufficiently different from the *Central* scenario.

Part 1 of *Appendix A* includes figures that are additional to what is presented in the Draft IIO Report, however they have been prepared using the same underlying data. EnergyCo intends for this information to supplement Part 1 of the main report to further illuminate for stakeholders the rationale for the network options proposed. For further information on the methodology and process for the economic analysis please refer to the Draft IIO Report.

In preparing the proposed network options in the NIS, EnergyCo considered this economic analysis and a set of guiding principles (see Part 4 of the main report) and the latest project information (see *Appendix B* for up-to-date project details). Part 2 of *Appendix A* includes a comparison between the network options selected in the *Central* scenario in the Draft IIO Report, and the network options proposed in the NIS under the *Deliver Now* and *Secure Now* categories.



Moree Solar Farm, Moree, NSW.

Part 1: Network expansion by REZ under each scenario

The pace and pathway of network expansion across each of the four modelled Renewable Energy Zones (REZ) varies across the three scenarios. The figures below in section 1.1 show cumulative network expansion across the modelling horizon per scenario for Central-West Orana (CWO), New England, South West and Hunter–Central Coast (HCC) REZs.

The Illawarra REZ was not included in the economic analysis because at the time of modelling, the potential network options had not yet been prepared. EnergyCo is now preparing the network options that would best suit the Illawarra REZ and these will be included in future editions of the NIS.

In all scenarios, the CWO, New England and South West REZs reach 4 GW, 6 GW and 2.7 GW of network capacity by 2033, respectively. The South West REZ maintains this capacity under all scenarios, as it is driven by the development of ISP Projects.

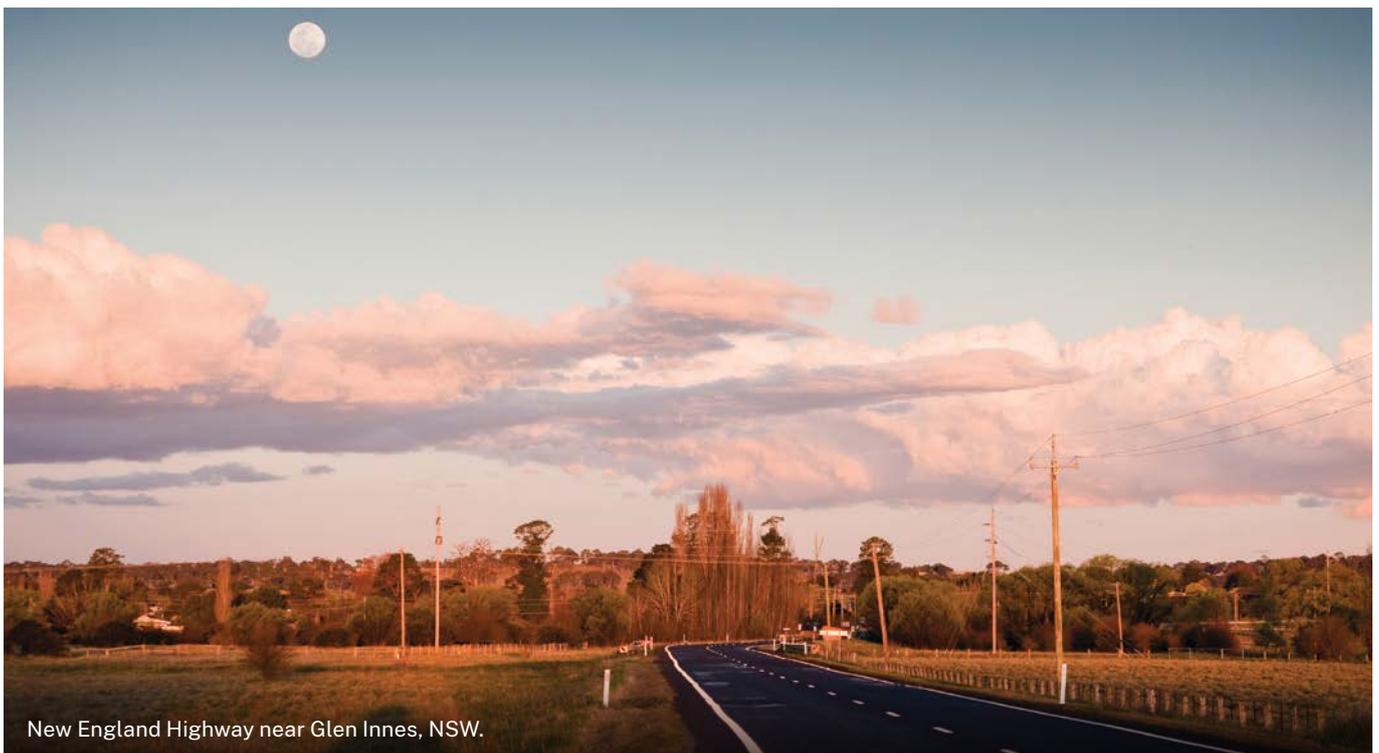
In the *Central* and *Transmission Delay* scenarios, CWO REZ increases 5.5 GW by the end of the modelling horizon. However, in the *Coal Exit by 2030 and Strong Electrification* scenario, CWO and New England REZs increase in scale further to 8.5 GW and 7.5 GW, respectively, to accommodate early retirement of coal-fired generation and greater electricity demand driven by electrification of society and a hydrogen export industry.

Meanwhile, the HCC REZ plays a supporting role. In the *Central* and *Coal Exit by 2030 and Strong Electrification* scenarios, it reaches 1 GW by 2033, and in the latter scenario lifts to around 3 GW by the end of the horizon. While in the *Transmission Delay* scenario, the REZ gains capacity of around 1.6 GW earlier, by 2033, to account for delays in the CWO and New England REZs.

The figures below in section 1.2 similarly show the expansion of network infrastructure under each scenario, but on a REZ-by-REZ basis and alongside forecast generation infrastructure development.

The South West REZ has not been depicted in this section. This is because its network capacity is primarily driven by the schedules of Project EnergyConnect, HumeLink and VNI West, and further investigation may be required into the outcomes of the economic analysis for new generation infrastructure development in the REZ. The economic analysis for the NIS suggested the amount of generation infrastructure would be lower than that suggested by the strong market response to the Registration of Interest process for this REZ, especially for wind projects.

In section 1.3, Table 1 outlines the Network Infrastructure Options and their timing, as were picked by the Consumer Trustee’s economic analysis.



1.1 Cumulative additional network expansion across all REZs by scenario

Figure 1: Cumulative additional network expansion by REZ under the *Central* scenario

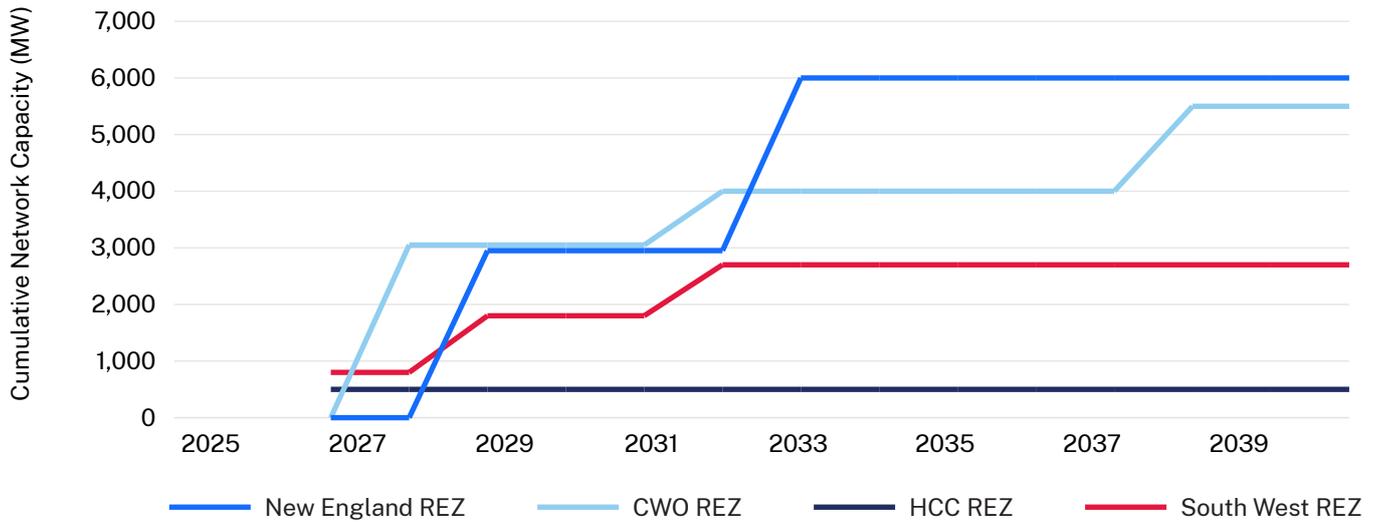


Figure 2: Cumulative additional network expansion by REZ under the *Transmission Delay* scenario

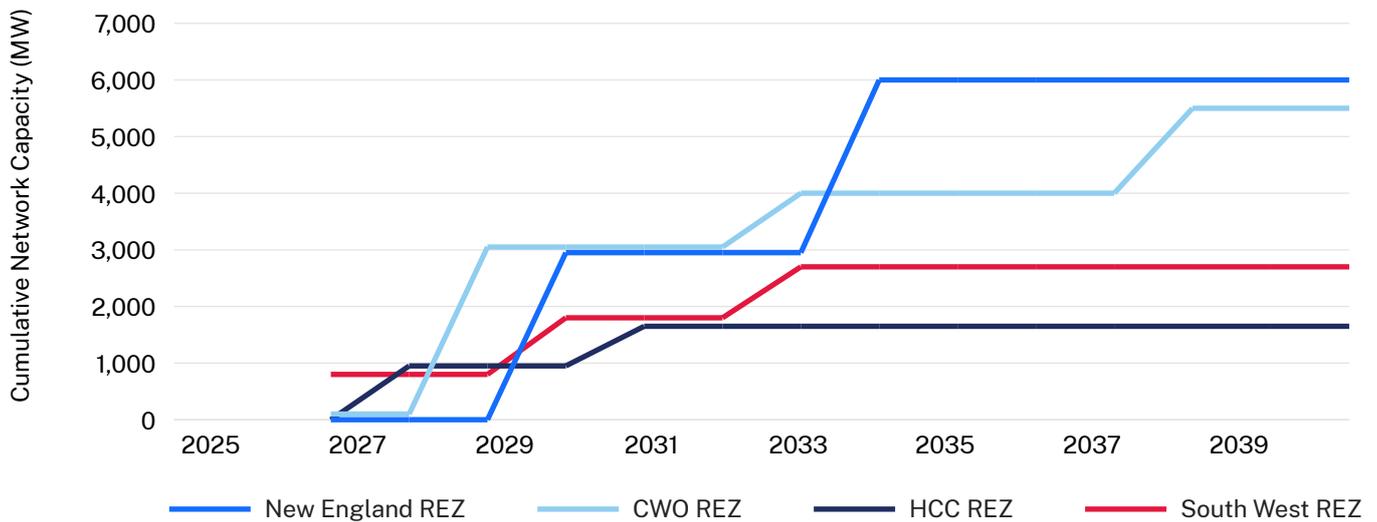
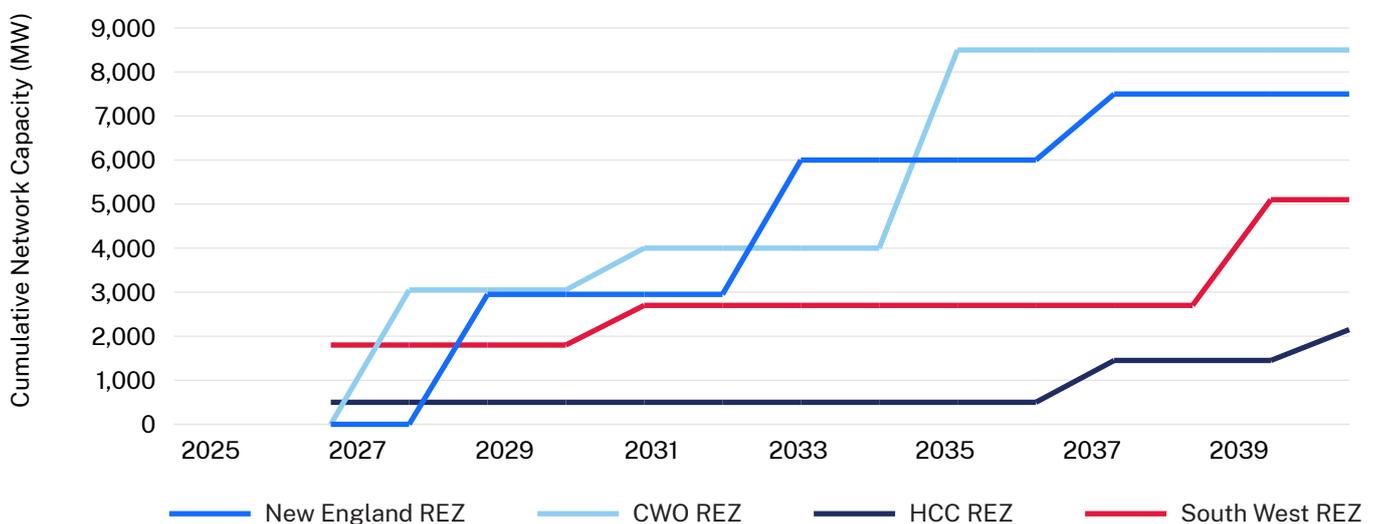


Figure 3: Cumulative additional network expansion by REZ under the *Coal Exit by 2030 and Strong Electrification* scenario



1.2 Cumulative network and generation capacity across each REZ by scenario

Central West Orana Renewable Energy Zone

Figure 4: Cumulative CWO REZ capacity build under the *Central* scenario

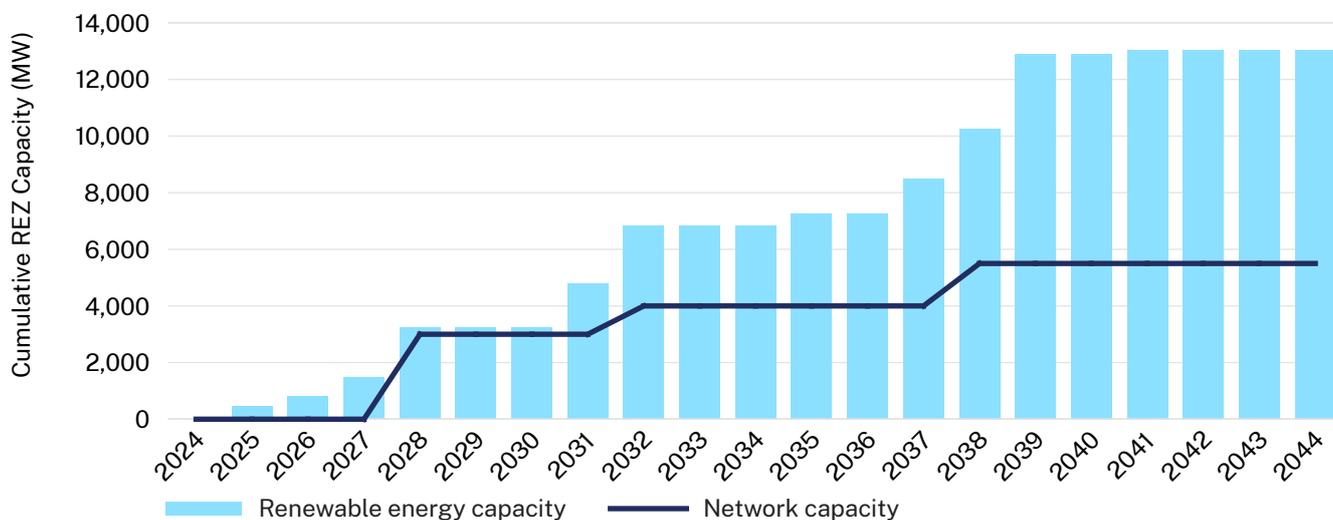


Figure 5: Cumulative CWO REZ capacity build under the *Transmission Delay* scenario

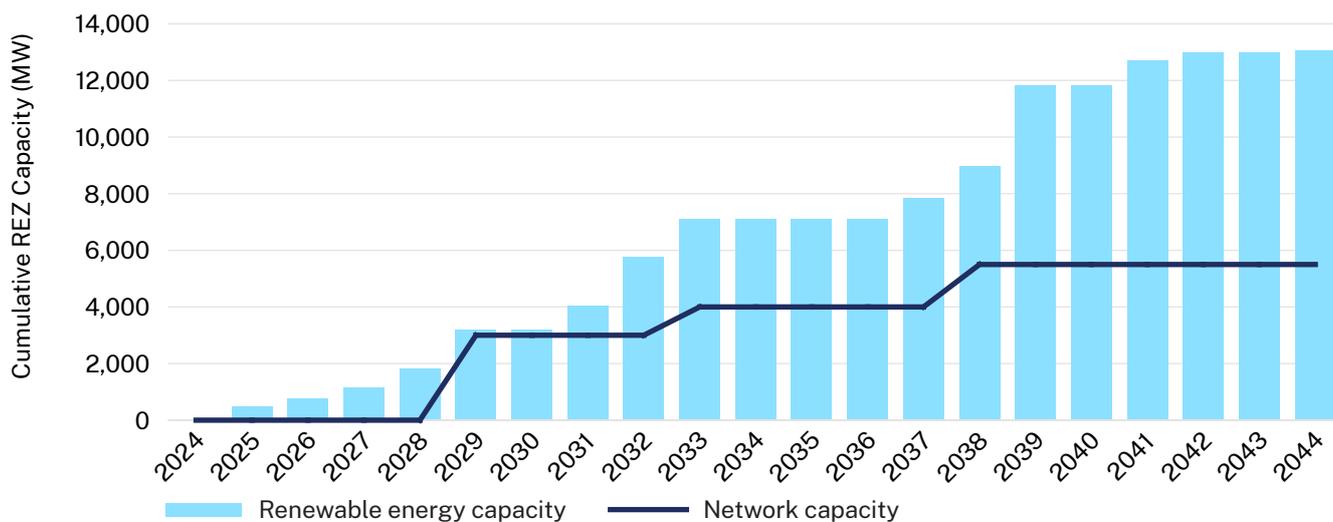
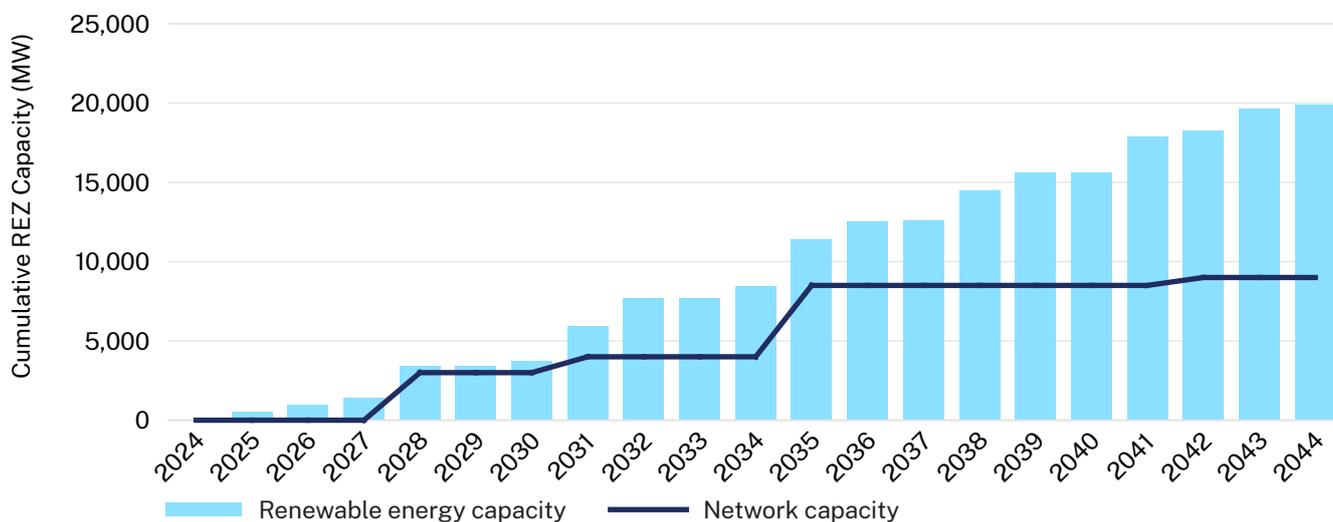


Figure 6: Cumulative CWO REZ capacity build under the *Coal Exit by 2030 and Strong Electrification* scenario



New England Renewable Energy Zone

Figure 7: Cumulative New England REZ capacity build under the *Central* scenario

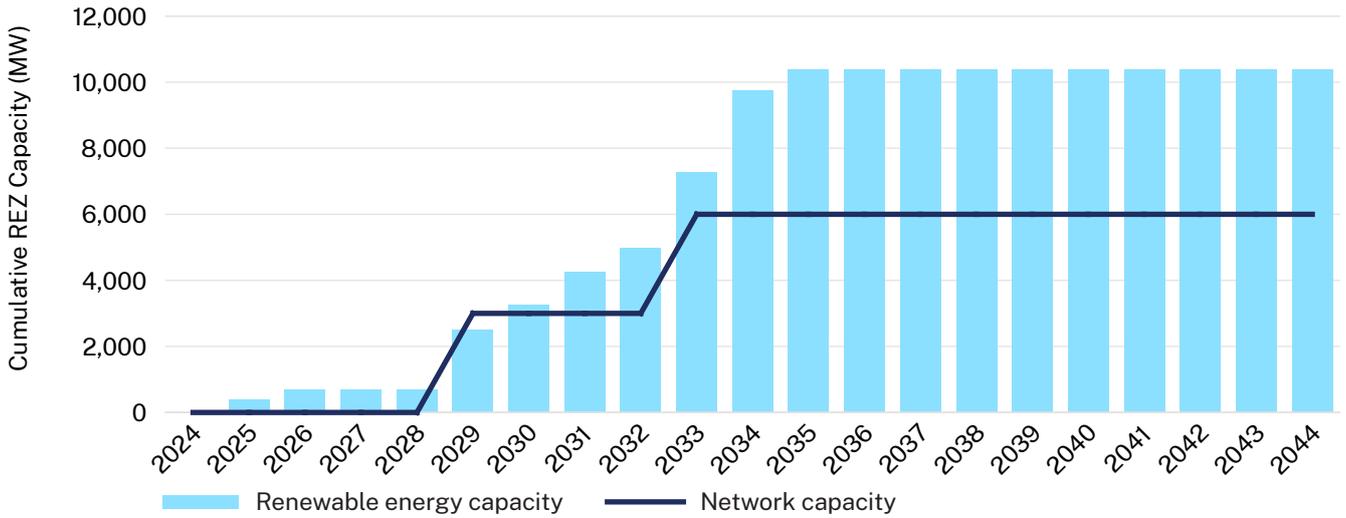


Figure 8: Cumulative New England REZ capacity build under the *Transmission Delay* scenario

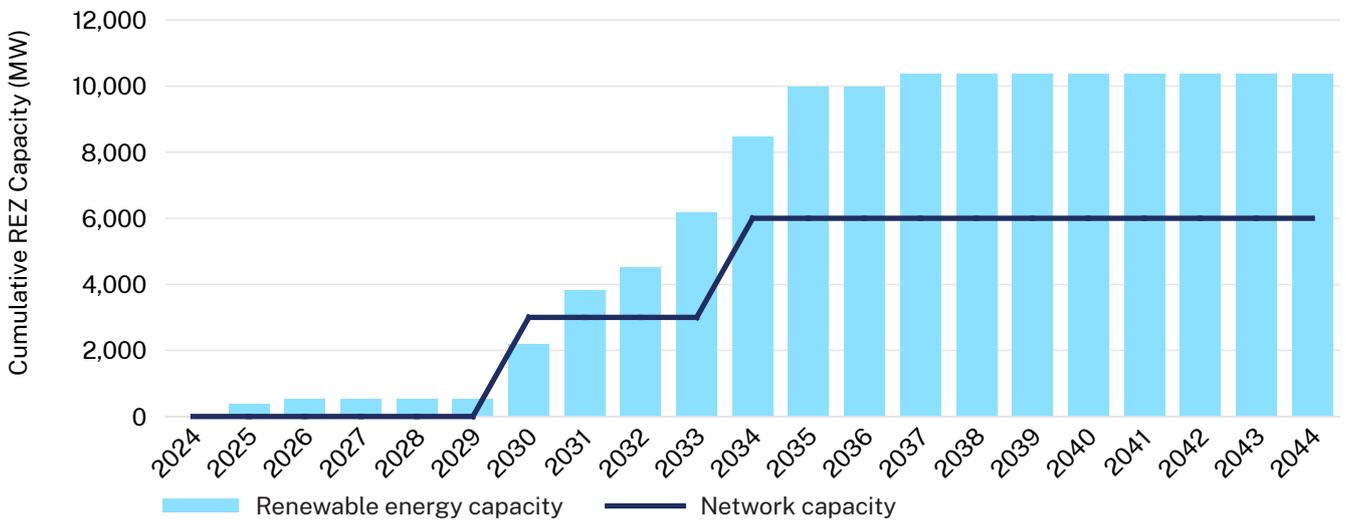
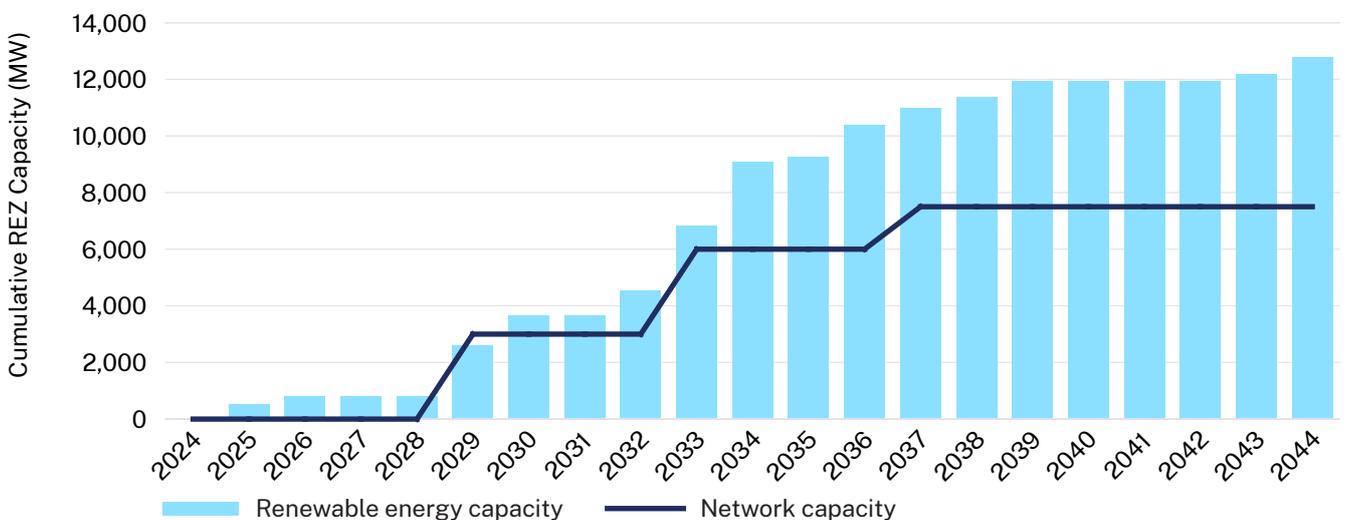


Figure 9: Cumulative New England REZ capacity build under the *Coal Exit by 2030 and Strong Electrification* scenario



Hunter-Central Coast Renewable Energy Zone

Figure 10: Cumulative Hunter-Central Coast REZ capacity build under the *Central* scenario

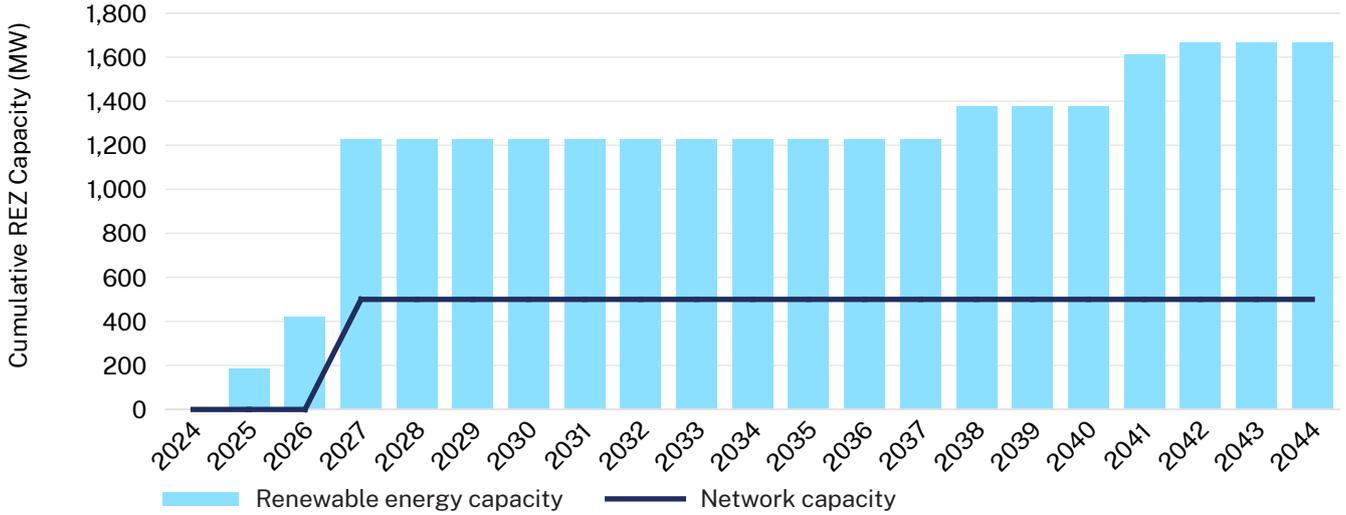


Figure 11: Cumulative Hunter-Central Coast REZ capacity build under the *Transmission Delay* scenario

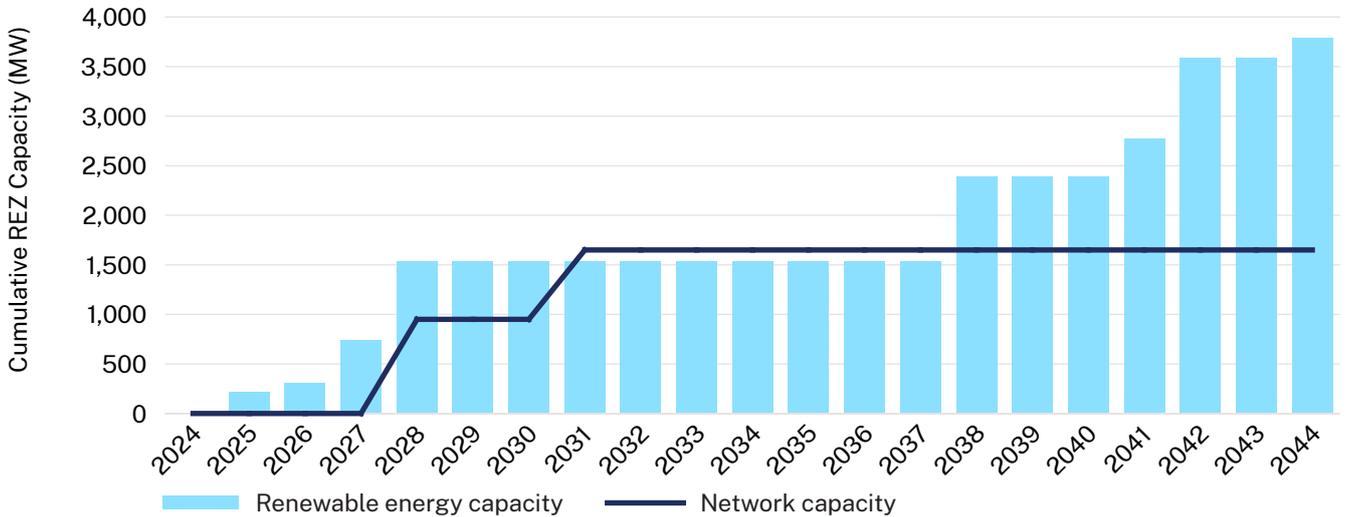
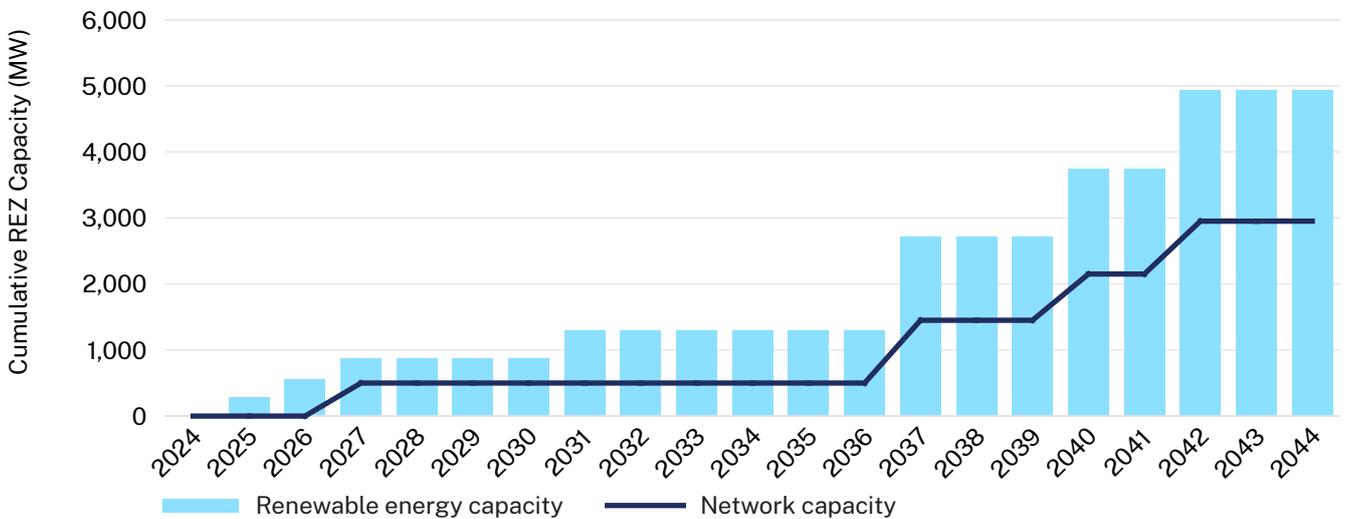


Figure 12: Cumulative Hunter-Central Coast REZ capacity build under the *Coal Exit by 2030 and Strong Electrification* scenario



1.3 Network Infrastructure Options selected in the Consumer Trustee’s economic analysis

Table 1: Network Infrastructure Options in the Draft 2023 Infrastructure Investment Objectives Report

Network Infrastructure Option	Existing Network Augmentation						New England			Central-West Orana					Hunter-Central Coast			
	CNSW-SNW Option 1 Hunter Transmission Project	SNSW-CNSW Option 1 Humelink	VIC-SNSW Option 2 VNI West-Kerang	Project Energy Connect	CNSW-NNSW Option 9	CNSW-SNW Hydrogen – Newcastle	Option 1	Option 2B	Option 3C	Option 1	Option 2A	Option 2B	Option 3A	Option 4	Option 1	Option 2	Option 3	Option 4
Capacity (MW)	5,000	2,200	1,930	800	2,000	5,000	3,000	3,000	1,500	3,000	1,000	1,500	3,000	500	950	700	500	800
Central	2028	2029	2032	2027	-	-	2029	2033	-	2028	2032	2038	-	-	-	-	2027	-
Transmission Delay	2029	2030	2033	2027	-	-	2030	2034	-	2029	2033	2038	-	-	2028	2031	-	-
Coal Exit by 2030 and Strong Electrification	2028	2027	2031	2027	2043	2041	2029	2033	2037	2028	2031	2035	2035	2042	2037	2040	2027	2042



Bungendore, with a wind farm in the background.

Part 2: Draft IIO 2023 and Final NIS Option Comparison

This Part compares the Network Infrastructure Options selected in the *Central* scenario in the Draft IIO Report and those proposed in the Final NIS under the *Deliver Now* and *Secure Now* categories. These options are needed to meet the infrastructure investment objectives in both documents. The costs represented here are Class 5b accuracy (i.e. +/- 50%) and for construction costs only, excluding finance and generator connection costs, and are in real 2021 Australian dollars.

Although there are differences in cost, the majority (88%) of this difference derives from including additional projects in the Final NIS, in line with the adjustments made by EnergyCo when considering the guiding principles and latest project information (refer to Table 2 and Table 3).

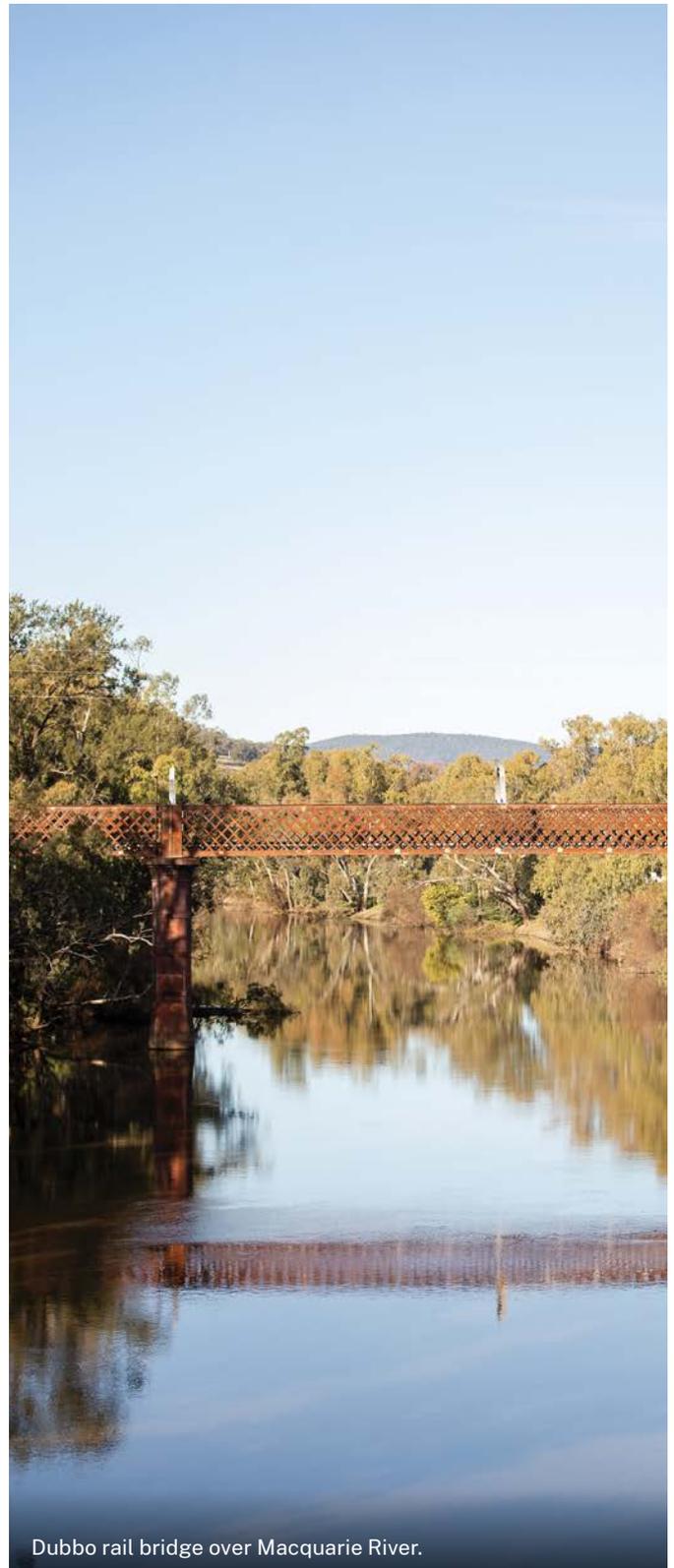
Table 2: Total cost difference between Draft IIO Report *Central* scenario network infrastructure development pathway and Final NIS *Deliver Now* and *Secure Now* categories

	Cost (\$bn)
Total Draft IIO Report Cost	9.4
Total Final NIS Cost	11.1
Total Cost Difference	1.7

Table 3: Contributions to cost difference

	Cost (\$bn)
Project Scope Difference	0.2
Inclusion of Additional Projects	1.5
Total Cost Difference	1.7

The detailed comparison can be found in Table 4. This table maps the augmentations that both reports present and highlights how certain projects have evolved since the time of modelling to the present. Network options highlighted in yellow are network augmentations proposed in the Final NIS to leverage the full benefits and ancillary services of long duration storage (LDS) to benefit the REZ and power system.



Dubbo rail bridge over Macquarie River.

Table 4: Comparison table between the Central Scenario Development Pathway from the Draft IIO Report and the proposed options in *Deliver Now* and *Secure Now*

	Draft IIO Report			Final NIS				Cost Difference (\$bn)	Notes
	Option	Capacity (GW)	Cost (\$bn)	Option	Capacity (GW)	NIS Cost (\$bn)	Strategic Category		
CWO	Option 1	3.00	2.5	Option 1	4.50	3.2	Deliver Now	0.5	Integrated Uarbry East and West into the base option. Increased network capacity due to an additional 1,500MVA transformer at Merotherie.
	Option 2A	1.00	0.1						
	Option 2B	1.50	0.2	Option 2B	1.50	0.3	Secure Now	0.1	Line alignment and substation sizing changed total cost. Capacity of new Option 2B is limited to 1.5GW to reflect downstream constraints.
	-	-	-	PHES Near Bathurst	0.33	0.1		0.1	Creates an option to support pumped hydro connection and provision of additional system benefits (subject to associated PHES proceeding).
			Option 5A	0.50	0.4	0.4	Added to create an option to support pumped hydro connection and provision of additional system benefits (subject to associated PHES proceeding).		
New England	Option 1	3.00	2.2	Option 1	2.40	2.2	Deliver Now	0.0	Reduced transfer capacity relative to previous New England REZ Option 1 due to N-1 Secure transfer limit constraints.
	Option 2B	3.00	2.1	Option 2B	3.60	2.0		-0.1	Increased transfer capacity relative to previous New England REZ Option 1 due to resolution of N-1 Secure transfer limit constraints.
	-	-	-	Option 5A	0.80	0.6	Secure Now	0.6	Added to create an option for pumped hydro connection and additional system benefits (subject to associated PHES proceeding).
HCC	Option 3	0.50	0.1	Option 1	0.95	0.4	Deliver Now	0.4	Recommended a slightly larger option to obtain insurance in case of delays to other transmission projects and to support pumped hydro connection and provision of additional system benefits (subject to associated PHES proceeding).
	-	-	-	Option 3	0.50	0.1	Secure Now	0.1	Added option to provide additional cost effective connection capacity in case of accelerated coal closure or electrification.
South West	Option 1	2.40	0.3	N/A	-	-	-	-0.3	South West REZ Option 1 was not picked in the Final NIS, as this is intended to be delivered through the 2022 Integrated System Plan.
HTP	HTP Stage 1	5.00	1.0	HTP Stage 1	5.00	1.0	Deliver Now	0.0	
WSB	The WSB Project	0.91	0.9	The WSB Project	0.91	0.9	Deliver Now	0.0	

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 NSW Department of Planning and Environment / Neil Fenelon

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Published by Energy Corporation of NSW, NSW Treasury

Title NSW Network Infrastructure Strategy

First Published May 2023

ISBN 978-1-76058-705-5

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