EnergyCo

Central-West Orana Renewable Energy Zone Transmission project

Summary

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NSW GOVERNMENT

Acknowledgement of Country

The Energy Corporation of NSW acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

Published by Energy Corporation of NSW

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First published: September 2023

Summary

Overview

Renewable Energy Zones

The NSW Government is leading the development of Renewable Energy Zones (REZ) to deliver renewable energy generation and storage, supported by high voltage transmission infrastructure across NSW. REZs will play a vital role in delivering clean, affordable and reliable electricity for homes, businesses and industry in NSW to help replace the State's existing coal power stations as they come to their scheduled end of operational life.

REZs will group new renewable energy generation infrastructure into locations where it can be efficiently stored and transmitted across NSW. Five regions have been identified for the development of REZs: the Central-West Orana, South-West, New England, Hunter-Central Coast and Illawarra regions of NSW.

The Central-West Orana REZ

The Central-West Orana REZ is approximately 20,000 square kilometres in size and centred by Dubbo and Dunedoo (refer to Figure S-1), on the land of the Wiradjuri, Wailwan and Gamilaroi peoples. The Central-West Orana REZ was formally declared on 5 November 2021 under section 19(1) of the *Electricity Infrastructure Investment Act 2020.* Under the declaration, the Energy Corporation of NSW (EnergyCo) was appointed by the NSW Government as the Infrastructure Planner responsible for coordinating the development of generation and network infrastructure. The Central-West Orana REZ declaration provides for an initial intended network capacity of three gigawatts. The NSW Government is proposing to amend the declaration to increase the intended network capacity to six gigawatts, which would allow for more renewable energy from solar, wind and storage projects to be distributed through the NSW transmission network.

Figure S-1 Central-West Orana REZ geographical area (Source: EnergyCo)

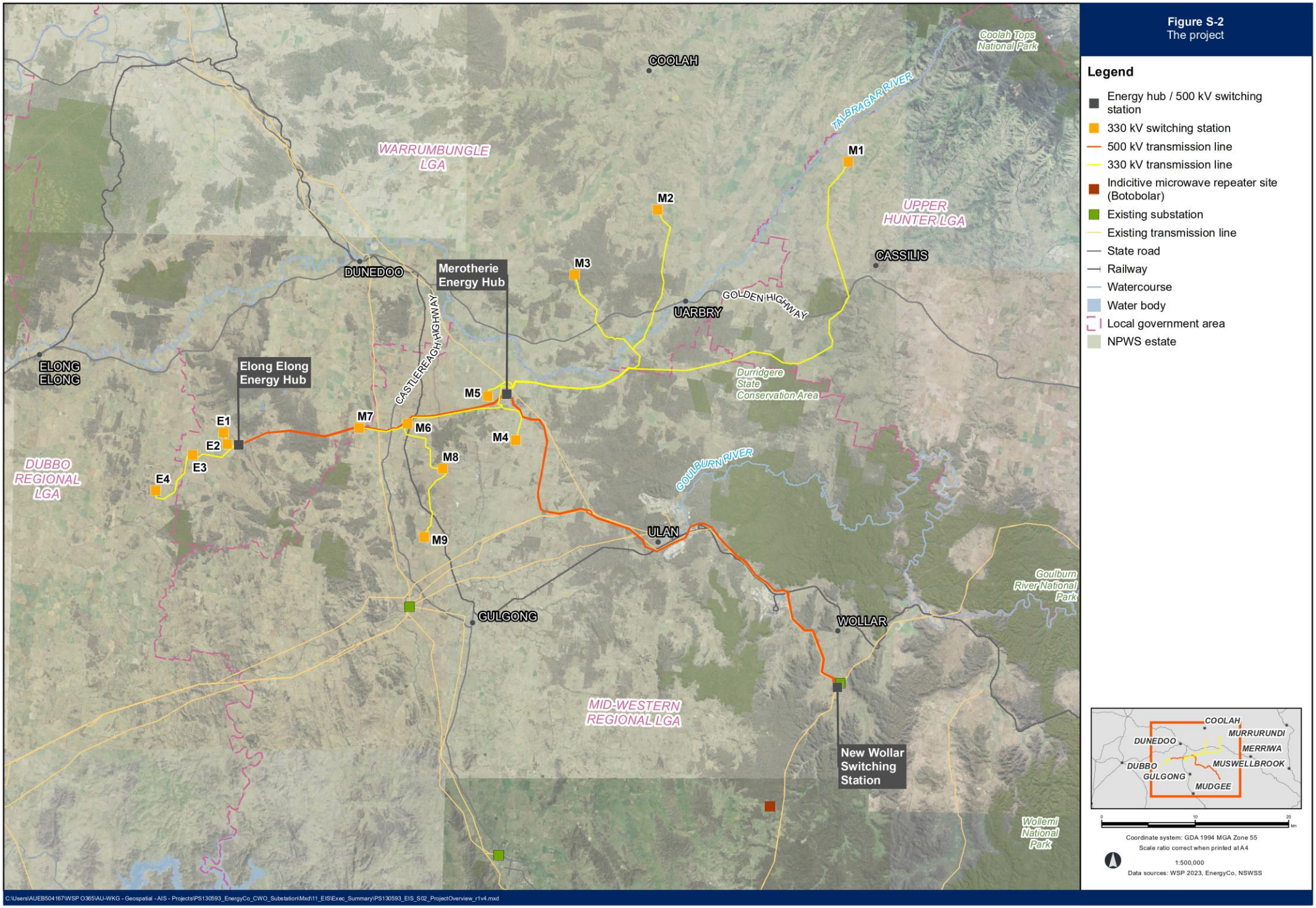
The project

EnergyCo is proposing the construction and operation of new electricity transmission infrastructure, new energy hubs and switching stations and ancillary works required to connect new renewable energy generation and storage projects within the Central-West Orana REZ to the NSW transmission network (the project). The project is located within the Warrumbungle, Mid-Western Regional, Dubbo Regional and Upper Hunter local government areas (LGAs) and generally extends north to south from Cassilis to Wollar and east to west from Cassilis to Goolma.

The project would enable 4.5 gigawatts of new network capacity to be unlocked by approximately the mid-2020s (noting the NSW Government's proposal to amend the Central-West Orana REZ declaration to increase the intended network capacity from three to six gigawatts). It would enable renewable energy generators to access new transmission infrastructure within the Central-West Orana REZ to export electricity to the NSW transmission network (as part of the National Electricity Market (NEM)). Importantly, the development of renewable energy generation projects in the Central-West Orana REZ is the responsibility of private generators and subject to separate planning and environmental approvals.

The project (refer to Figure S-2) would include the following features:

- a new switching station (the New Wollar Switching Station), located at Wollar to connect the project to the existing 500 kilovolts (kV) transmission network
- around 90 kilometres of twin double circuit 500 kV transmission lines and associated infrastructure to connect two energy hubs to the existing NSW transmission network via the New Wollar Switching Station
- energy hubs at Merotherie and Elong Elong (including a potential battery storage option at the Merotherie Energy Hub) to connect renewable energy generation projects within the Central-West Orana REZ to the 500 kV network infrastructure
- around 150 kilometres of single circuit, double circuit and twin double circuit 330 kV transmission lines, to connect renewable energy generation projects within the Central-West Orana REZ to the two energy hubs
- thirteen switching stations along the 330 kV network infrastructure at Cassilis, Coolah, Leadville, Merotherie, Tallawang, Dunedoo, Cobbora and Goolma, to transfer the energy generated from the renewable energy generation projects within the Central-West Orana REZ onto the project's 330 kV network infrastructure
- underground fibre optic communication cables along the 330 kV and 500 kV transmission lines between the energy hubs and switching stations
- construction of microwave repeater sites at locations along the alignment, as well as off the alignment at Botobolar, to provide a communications link between the project and the existing electricity transmission and distribution network
- a maintenance facility within the Merotherie Energy Hub to support the operational requirements of the project
- establishment of new, and upgrade of existing access tracks for transmission lines, energy hubs, switching stations and other ancillary works areas within the construction area (such as temporary waterway crossings, laydown and staging areas, earthwork material sites with crushing, grinding and screening plants, concrete batching plants, brake/winch sites, site offices and workforce accommodation camps)
- property adjustment works to facilitate access to the transmission lines and switching stations. These works include the relocation of existing infrastructure on properties that are impacted by the project
- utility adjustments required for the construction of the transmission network infrastructure, along with other adjustments to existing communications, water and wastewater utilities. This would include adjustments to existing Transgrid and Essential Energy transmission infrastructure. This includes adjustments to Transgrid's 500 kV transmission lines 5A3 (Bayswater to Mount Piper) and 5A5 (Wollar to Mount Piper) to provide a connection to the existing NSW transmission network, including new transmission line towers along the Transgrid network along the frontage of the New Wollar Switching Station, and other locations where there is an interface with Transgrid's network.


COOLAH
Coolah Tops National Park
TALBRAGAR RIVER
WARRUMBUNGLE LGA
M1
M2
UPPER HUNTER LGA
CASSILIS
DUNEDOO
Merotherie Energy Hub
M3
GOLDEN HIGHWAY
UARBRY
CASTLEREAGH HIGHWAY
ELONG ELONG
Elong Elong Energy Hub
Durridgere State Conservation Area
M5
M7
M6
M4
E1
E2
E3
E4
M8
DUBBO REGIONAL LGA
GOULBURN RIVER
ULAN
M9
Goulburn River National Park
GULGONG
WOLLAR
MID-WESTERN REGIONAL LGA
New Wollar Switching Station
Wollemi National Park
Figure S-2
The project
Legend
Energy hub / 500 kV switching station
330 kV switching station
500 kV transmission line
330 kV transmission line
Indicitive microwave repeater site (Botobolar)
Existing substation
Existing transmission line
State road
Railway
Watercourse
Water body
Local government area
NPWS estate
COOLAH
MURRURUNDI
DUNEDOO
MERRIWA
DUBBO
MUSWELLBROOK
GULGONG
MUDGEE
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Coordinate system: GDA 1994 MGA Zone 55
Scale ratio correct when printed at A4
1:500,000
Data sources: WSP 2023, EnergyCo, NSWSS
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Timing

Development of the project, including investigation of alignment options and other design alternatives, has been ongoing since 2018 (see Figure S-3).

Construction of the project would commence in approximately the second half of 2024, subject to NSW Government and Commonwealth planning approvals, and is estimated to take about four years. This includes an initial period of enabling works, main construction works and a commissioning period of around three years, and a construction site decommissioning and rehabilitation period. The project is expected to be commissioned/energised (i.e. become operational) in or around the second half of 2027.

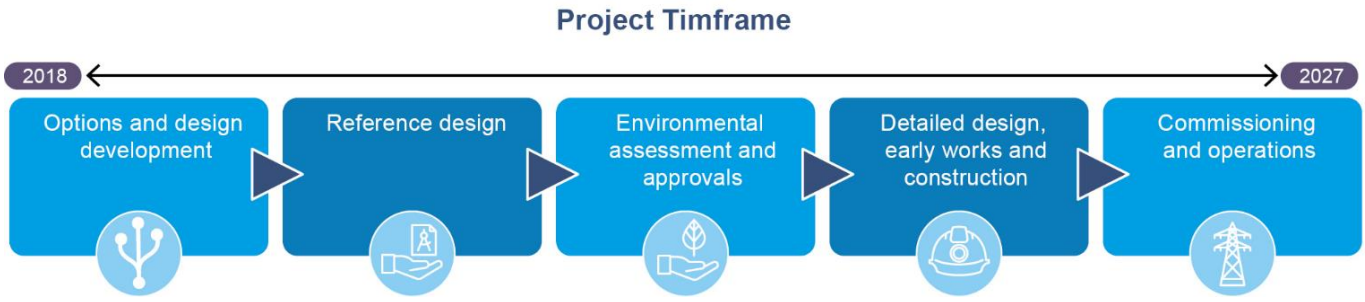

Figure S-3 Project timeframe

Related development

Related development is development that responds to the opportunities created by the project or which is required as a result of the project. All related development projects are subject to separate planning and approval processes.

A range of proposed renewable energy generation and storage projects located in the Central-West Orana REZ (and which are subject to separate approvals) would connect to the project, subject to the outcomes of the Consumer Trustees competitive tender process for rights to access the new transmission infrastructure. Where practicable, a number of the project's switching stations have been located with infrastructure from the renewable energy generation projects and, where suitable, the access road network provided under these projects would be utilised.

Other related development projects, which are subject to separate planning and approval processes, include:

- adjustments and upgrades to public roads that are required to facilitate access for construction of the project, including upgrades to the strategic road network (from the ports where equipment is imported) and localised upgrades to access the energy hubs. These upgrades would include replacement of existing bridges, culverts and/or causeways. These upgrades have also been included in the EIS so that in the event that they are not determined under separate planning and approval processes, they can be determined under this application.
- upgrade to the existing Transgrid network between Mount Piper and Wallerawang to strengthen the grid in the Central Tablelands, helping to ensure that power from the Central-West Orana REZ can be reliably moved back into the grid and to consumers.

Need for the project

The Australian Government is committed to coordinated global action to reduce greenhouse gas emissions in line with the Paris Agreement and has set targets to reduce emissions by 43 per cent below 2005 levels by 2030 and to net zero by 2050. Independently, the NSW Government has set a goal to achieve net-zero emissions by 2050 (NSW Department of Planning, Industry and Environment (DPIE), 2020a). Achieving these goals requires transformative low emissions technologies to be deployed at scale across all sectors of the economy. This includes the electricity generation sector which is currently Australia's largest source of greenhouse gas emissions, accounting for 33 per cent of Australia's total annual emissions in 2020 (Climate Change Authority, 2020).

Coal-fired generation is being withdrawn faster than anticipated (Australian Energy Market Operator, 2022a), due to large coal-fired power plants, such as the Eraring and Bayswater power stations, closing ahead of originally anticipated retirement dates (Eraring power station to potentially close by 2025 and Bayswater power station to close by 2033). This highlights the urgent need to develop and connect new renewable energy to the NEM, to continue to have enough energy to meet future demand, while meeting Australia's carbon emissions policy commitments.

Current interest in new energy generation projects in the NEM exceeds the existing transmission network capacity in several locations, meaning that not all projects would be able to connect to the network. The transmission grid therefore needs targeted augmentation, including strategically placed large-scale interconnectors and transmission line extensions, to balance resources and unlock REZs in new regions. The existing transmission network is not capable of transferring the scale of new electricity generation identified for the Central-West Orana REZ. Development of new electricity generation and storage projects in the Central-West Orana REZ will require new high voltage transmission infrastructure to connect to and provide enough capacity to meet demand. The project need is set out in further detail in Chapter 2 (Strategic context).

Project objectives

The project challenges, corresponding objectives and overall project outcomes are summarised from a strategic perspective in Figure S-4 and from a project design and delivery perspective in Figure S-5. The objectives respond to the project need and the strategic and regional context of the Central-West Orana REZ.

Strategic		
Challenges	**Objectives**	**Outcomes**
Ability to meet emission reduction targets set by the NSW Government and the Australian Government	• Support government decarbonisation targets and the transition of the NEM from traditional energy sources to lower emission alternatives based on renewable energy.	• Reduced emissions and a greater mix of renewable energy in the NEM.
Planned closure of aging major coal-fired power generators over the coming decade will create power shortages if this generation capacity is not replaced	• Develop the architecture for the Central-West Orana REZ so that it encourages delivery of, and reduce barriers to the development of viable grid-scale renewable energy projects within the REZ in the near term to deliver a source of affordable and reliable energy. • Deliver the Central-West Orana Transmission Project, a key element of the NSW Electricity Strategy and Electricity Infrastructure Roadmap, by the mid 2020's before the retirement of key coal-fired power stations. • Provide high-capacity connections to mature grid-scale generation projects within the Central-West Orana REZ to enable earlier delivery of bulk power.	• Improved reliability and energy security, by delivering large amounts of new energy supply into the NEM. • Unlock major investment in new renewable energy and regional economies. • Placing downward pressure on customer bills through lower energy generation costs and increased competition.
Increased demand for electricity as technology and industry shifts towards electrification	• Design the Central-West Orana REZ to meet current bulk energy demands and enable efficient expansion to meet future demand as this grows.	• Network infrastructure that will: – meet current and future needs efficiently, reducing ongoing impacts to the community by building it right the first time; and – support ongoing development and investment in renewable energy projects within the REZ to meet growth in demand.
Traditional sources of inertia and stability in the network are lost as fossil fuel generators are retired	• Design the Central-West Orana REZ to address issues of inertia and stability by including equipment and technology within the design of the Central-West Orana REZ to ensure stability and reliability.	• Delivery of a transmission network that can efficiently and reliably deliver bulk power from renewable sources at reliability levels consumers expect of the NEM.

Figure S-4 Strategic project challenges, objectives and outcomes

Project		
Challenges	**Objectives**	**Outcomes**
Delivering a project that minimises impacts to local communities along the transmission route during construction and operation	• Engage in open and honest dialogue with the community and stakeholders during the development and delivery of the project, to improve the design and reduce impacts to the community and landowners where reasonable and feasible. • Through corridor development and refinement, avoid large centres of population. • Work with landowners to identify how the project may impact their properties and businesses and develop measures to manage and mitigate those impacts.	• Deliver a project that is supported by the local community and landowners by engaging in an open and transparent consultation process through the development of the projects design, as well as its construction and operation.
Potential for the project to result in conflict with other valued land uses such as agriculture	• Plan for, design and deliver a project that: – Seeks to utilise previously disturbed land to avoid and minimise impacts to other valued land uses. – Minimises the amount of prime agricultural land required for construction and permanent operational infrastructure. – Allows for continued agricultural land uses and farming practices within the Central-West Orana REZ.	• Impacts to agricultural land and farming practices would be avoided and minimised as much as possible throughout construction and operation of the project.
Cumulative impacts of network infrastructure and generation projects	• Plan and deliver transmission and generation projects in a coordinated manner and in consultation with stakeholders, including generators. • Reduce cumulative impacts from construction and operation of the project with other renewable energy projects in the Central-West Orana REZ.	• Efficient and coordinated delivery of network infrastructure and generation projects. • Reduced impacts on local communities during construction and operation.
Potential for the project to result in adverse environmental impacts	• Plan for, design and deliver a project that protects natural and cultural resources, and minimises impacts to: – natural systems, including biodiversity – Aboriginal and non-Aboriginal cultural heritage – visual amenity – water resources and water quality. • Implement strategies to mitigate and offset impacts and to recreate important environmental values in the region.	• Environmental impacts of the project during construction and operation would be avoided and minimised where feasible. • The scale of the project allows new environmental values to be recreated for the benefit of the region. • The project will support the delivery of viable grid-scale renewable energy to reduce the need for fossil fuel generators.

Figure S-5 Project delivery challenges, objectives and outcomes

Alternatives considered

The project has undergone a process of the development and evaluation of alternative transmission corridor options from feasibility to early design development. Once the need for the project was established, the following strategic alternatives were identified and evaluated between 2019 and 2021:

- Strategic option 1: Base case ('do nothing')
- Strategic option 2: Optimisation and modification of existing transmission line infrastructure ('do minimum')
- Strategic option 3: Provision of new transmission capacity to meet known renewable energy demand and allow for future expansion.

Strategic options 1 and 2 were considered unsuitable as they would not provide the increased network capacity needed to encourage the scale of renewable energy investment required to meet government emission reduction targets and to provide an affordable and reliable source of new energy to meet current and future electricity demand.

Strategic option 3 was selected as it includes new transmission lines that would be planned with consideration of the locations of known renewable energy projects currently under development. In addition, the transmission infrastructure to be provided as part of this option would be designed so that there is sufficient capacity for future renewable energy generators within the Central-West Orana REZ to connect. Strategic option 3 aligns with all of the strategic project objectives and is considered to be the preferred strategic option for the project.

In 2020, the NSW Government engaged Transgrid, as NSW's jurisdictional transmission planner at the time, to carry out early development work to guide the planning of new transmission infrastructure for the Central-West Orana REZ. In December 2020, Transgrid released a preliminary study corridor for the project that ran northwest from the existing network near Merriwa, passing south of Dunedoo before connecting to the existing network east of Wellington.

In November 2021, the Central-West Orana REZ was formally declared by the Minister for Energy and Environment and EnergyCo was appointed as the Infrastructure Planner to lead the delivery of REZs. At this time, EnergyCo assumed responsibility for planning and design of the transmission corridor and engaging local communities and stakeholders to inform the development of new transmission network infrastructure within the REZ.

In February 2022, EnergyCo released a revised study corridor for the project (shown in the *Central-West Orana Renewable Energy Zone Transmission project Scoping Report* (EnergyCo, 2022c)), which responded to community feedback Transgrid received on their December 2020 preliminary study corridor to reduce the extent of transmission infrastructure in high value agricultural land. The EnergyCo revised study corridor incorporated mining areas and existing transmission easements to the south of Goulburn River National Park. Importantly this section of the revised study corridor was intentionally narrow due to the presence of important biodiversity and heritage features including Goulburn River National Park, Munghorn Gap Nature Reserve, mapped important Regent Honeyeater habitat, and highly sensitive Aboriginal cultural heritage sites. By locating the revised study corridor in disturbed mining areas and with existing transmission lines, impacts to these important constraints were able to be avoided or minimised.

The design development of the project from the identification of the revised study corridor through to the current Environmental Impact Statement (EIS) alignment has aimed to avoid or minimise potential impacts. Continuous refinement at each stage of project development has included identification of significant environmental constraints that would be desirable to avoid or impact minimally.

The consideration of alternatives is set out in further detail in Chapter 2 (Strategic context).

Approval pathway

The project was declared as Critical State Significant Infrastructure (CSSI) under section 5.13 of the EP&A Act and is considered essential for the State for economic, environmental or social reasons. The project is subject to approval by the NSW Minister for Planning under Division 5.2 of the EP&A Act.

The project is also a controlled action and requires a separate approval from the Commonwealth Minister for the Environment and Water (or its delegate) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Cth) (refer to Figure S-6). The project will be assessed under the NSW Assessment Bilateral Agreement under Part 9 of the EPBC Act, and the EPBC assessment requirements have been included in the Secretary's environmental assessment requirements (SEARs) issued for the project.

This EIS has been prepared to support EnergyCo's application for approval in accordance with the requirements of Division 5.2 of the EP&A Act. It has been prepared with regard to the NSW Department of Planning and Environment's (DPE) *State Significant Infrastructure Guidelines* (DPE, 2022i) and addresses the SEARs issued for the project.

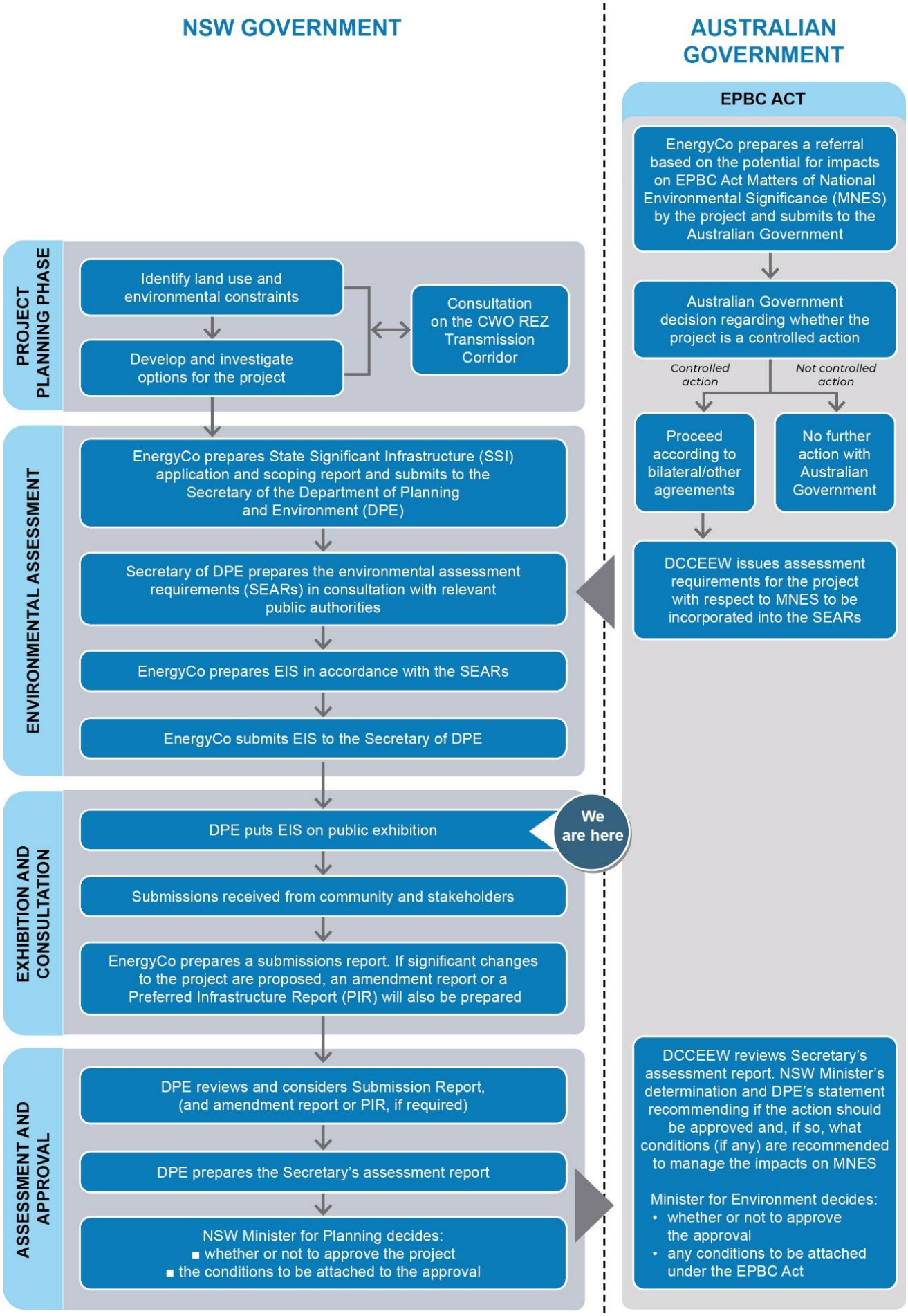

Figure S-6 Planning approval process for the project

Engagement

The project is a large and complex infrastructure project with a high level of interest from the community and other stakeholders, including renewable energy supplier generation projects in the Central-West Orana REZ. EnergyCo recognises the diverse engagement and information needs of the community and is committed to a robust plan of engagement that will continue to be inclusive and encourage participation.

Between December 2020 and September 2021, community consultation was carried out by Transgrid on the preliminary study corridor for new transmission network infrastructure in the Central-West Orana REZ. EnergyCo assumed responsibility for continuing engagement with communities and stakeholders for the project when it was appointed as Infrastructure Planner for the Central-West Orana REZ in November 2021. Since this time, EnergyCo has carried out a comprehensive program of community and stakeholder engagement to build on the engagement previously carried out by Transgrid. A key aim of engagement activities has been to gather community and stakeholder feedback to be considered in the refinement of the study corridor and design for the project.

A variety of engagement tools have been established for the project to seek input from the community and stakeholders, from a dedicated project phone number to sessions with the Community Reference Group established in August 2022 and more. The feedback and suggestions received from the community and stakeholders have been considered in combination with engineering and environmental studies, to further refine the project and the development of this EIS.

Key issues raised by the community and stakeholders include:

- concerns about the consultation process, including a view in the community that there was inadequate consultation on the project at the time, but also feedback that there was broader consultation fatigue as a result of the large number of development projects (and associated consultation processes) in the region
- the impact of construction, including disturbance of private land, disruption of social services, use of accommodation camps for the construction workforce and traffic management
- impacts to agricultural activities during construction and operation including any restrictions on activities as a result of the easement
- environmental impacts including vegetation clearing, erosion and waste generation
- visual impacts from project infrastructure
- bushfire risks associated with the transmission line as a source of ignition
- clarification of the process for the development of the alignment including any alternatives considered
- REZ planning and governance including the need and approach taken to developing the REZ
- socio-economic impacts including business impacts and community benefits.

Engagement for the project is further addressed in Chapter 5 (Community and stakeholder engagement).

Environmental assessment

Land use and property

The project has been designed, where feasible, to avoid or minimise potential land use and property impacts. This has included locating the project alignment along property boundaries, next to existing transmission line easements or positioning infrastructure in areas that align with current land use activities. The location of permanent infrastructure has also been guided by, amongst other things, landowner feedback, and the willingness of landowners to host project infrastructure on their property. Where feasible, the project has been designed to maximise the use of already disturbed land, such as mining land and industrial land.

The primary land use within the Central-West Orana region is agriculture. Other key land uses include protected areas (such as National Parks and State Conservation Areas) and mining operations. Land tenure is predominantly freehold, with some areas of Crown land, (including road reserves), rail corridors, travelling stock reserves, state forests and NSW National Parks and Wildlife estate.

Construction of the project would require around 4,000 hectares of land, which once established would result in a change in the existing land use, either permanently or temporarily until construction activities are completed. The operation area of the project is around 2,700 hectares, but is subject to ongoing refinement and would be finalised as part of continued design development. In particular, the operation area is expected to increase at the Elong Elong Energy Hub due to the configuration of the initial 330 kV operation. Within permanent easements for operation outside of transmission line tower footprints, agricultural land use would continue with some restrictions to certain agricultural activities (such as cropping or horticulture). There may be the requirement to adjust infrastructure on private property (such as sheds, fencing, dams and access tracks), which would be undertaken in consultation with the landowner.

The Central-West Orana REZ has a long history of agricultural and mining activities, and while these land uses are expected to continue, the region is experiencing a shift in land use, as part of the larger energy transition. This shift is supported by the *Central West and Orana Regional Plan 2041* (DPE, 2022a), which recognises and supports the establishment of the Central-West Orana REZ, while aiming to ensure compatibility with existing land use practices and minimise the associated environmental and social impacts. Once operational, the project would support the future land use as envisioned by the *Central-West and Orana Regional Plan 2041*.

Agriculture

Most agricultural operations in the region involve the production of livestock (sheep and cattle), with cropping operations focused in areas of higher quality soils. The total gross value of agricultural production in the four LGAs within which the project is located is around $652 million, with the grazing of cattle and calves the most valuable agricultural commodity.

The project would require the use of agricultural land either permanently for operation or temporarily until construction activities are completed. The level of impacts on agricultural land use and productivity would vary depending on the scale and intensity of construction activities. In areas where a higher intensity of construction activities is required, such as the location of transmission line towers, agricultural activities would be impacted, and in many locations, permanently removed from use. In areas where a lower intensity of construction activities are required, such as areas of land in between transmission line towers, impacts to agricultural productivity would not be affected to the same degree. It is expected there could be a continuation of some agricultural activities in these areas, subject to certain conditions that would be established through property management plans to be developed for each property, in consultation with the affected landowner.

During construction, around 1,820 hectares of agricultural land is expected be directly affected by the establishment of temporary and permanent structures and facilities, however for the purpose of estimating total impacts and presenting a worst case assessment, it is assumed the entire construction area (approximately 3,660 hectares of agricultural land) would be unavailable for use during construction. This would result in an estimated loss of agricultural production of around $1.35 million per annum during the construction period, which is equivalent to approximately 0.21 per cent of the total gross value of agricultural production across the four LGAs over the same period.

The project also has the potential to place restrictions on the movement of landowners, workers, livestock, and equipment within and across the construction area, temporarily and permanently limiting cropping and aerial agricultural operations, removal of vegetation (as shade or shelter), and changes to farm infrastructure such as fencing and dams. These impacts would be managed in accordance with Property Management Plans.

Once operational, around 825 hectares of agricultural land would be permanently removed due to the establishment of permanent infrastructure (the operation area is subject to ongoing refinement and would be finalised as part of continued design development). The remainder of the agricultural land within the operational area consists of transmission line easements, where land would continue to be used for grazing and other agricultural activities such as cropping, subject to certain restrictions. The permanent loss of agricultural land is equivalent to 0.04 per cent of the total area of agricultural land use in the four impacted LGAs and represents an estimated productivity loss of around $317,550 per annum.

Landscape character and visual amenity

The project consists of four landscape character areas; rural valleys, forested hills, mining areas, and undulating rural hills. The landscape and visual sensitivity of these landscape character areas varies and is influenced by scenic, historic and recreational sites. Localities identified as likely to have an elevated landscape character and visual sensitivity within and near the landscape and visual study area include:

- conservation and recreational landscapes such as Goulburn River National Park and Munghorn Gap Nature Reserve
- local highpoints offering views, such as Coolah valley lookout
- small rural towns, such as Ulan, Wollar and Cassilis
- heritage items such as Laheys Creek Cemetery along Spring Ridge Road and Wandoona Homestead south of Wollar.

Twenty-six publicly accessible viewpoints were selected as representative of the range of landscape views to the project. In addition to the ground level viewpoints, a viewpoint from the air was selected to represent recreational flights operating from Dubbo Airport and Mudgee Airports. The assessment also identified 91 private properties with the potential to have a visual impact during the operation of the project and were subject to a detailed visual assessment. Of these private viewpoints, 38 are host properties and 53 are properties that would not host project infrastructure (non-host). Public and private viewpoints were selected based on review of digital terrain mapping and site inspections.

The main visual impacts during construction would be from vegetation removal, earthworks and introduction of plant and equipment and ancillary facilities including the construction compounds and accommodation workforce camps. The impacts would be temporary and transient along the transmission line alignment. During construction, the project would result in negligible to moderate impacts at the landscape zone viewpoints and representative viewpoints during the day and night. Moderate impacts would occur in locations where views are close to the construction area, where there are views of concentrated construction activity (such as at energy hubs) and/or where there are clear views to construction activities.

The main visual impacts during operation would be from the introduction of large-scale structures including transmission towers and energy hubs. The project would have negligible to moderate visual impacts at the public viewpoints. The majority of public viewpoints would experience a moderate to high magnitude of change given the prominence of the project within a rural landscape with limited large-scale structures. Areas of moderate impact would occur at locations where there is a clear view of the project (often with little screening vegetation) or where the project would result in a substantial change in rural character or scenic values of the view. Low-moderate impacts would occur generally in locations with lower visual sensitivity and in locations away from energy hubs.

Of all the assessed private viewpoints, it was identified that 10 host properties and three non-host properties would experience a high visual impact, and seven host properties and 13 non-host properties would experience a moderate visual impact. However, these impacts may potentially be reduced through the implementation of mitigation measures. Photomontages and three-dimensional modelling has been prepared for some viewpoints to support the assessment of visual impact. These views illustrate locations where the project would be seen from locations of higher visual sensitivity and also to show a typical view within some of the landscape character types.

Operation of the transmission line would not require any lighting and would therefore have no impact during operation at night. The energy hubs at Merotherie and Elong Elong would have low-level lighting at night during operation for security and maintenance access. Four properties in close proximity to the energy hubs would experience views to the energy hub lighting at night. The switching stations would also be lit at night, including low-level lighting for security and maintenance access. Lighting at the energy hubs and switching stations will be designed and operated with consideration of minimising obtrusive lighting impacts.

Biodiversity

The project is located in an area which has been widely cleared for agriculture with scattered patches of woodland remaining. These remnant patches, while fragmented, provide important habitat for certain threatened species (such as the threatened Squirrel Glider).

Extensive field surveys of the construction area were undertaken between mid-2022 and mid-2023 to support the biodiversity assessment. Field surveys were generally carried out in accordance with the relevant NSW and Commonwealth guidelines and included:

- field validation of vegetation mapping using random meander surveys and vegetation integrity plots
- threatened flora survey for candidate threatened species
- threatened fauna survey using targeted seasonal surveys, and geographic and habitat constraints assessments.

Native vegetation covers around 58 per cent of the project's construction area, with the remaining areas consisting of buildings and roads, cropping land and pastures dominated by exotic pasture species. The project has sought to avoid and/or minimise biodiversity impacts where possible during design development and selection of the vegetation clearing strategies to avoid full clearing of the construction area and during ongoing maintenance.

While efforts have been made to avoid impacts to biodiversity, some impacts could not be avoided. A number of competing environmental and technical constraints are present which requires adopting a balanced approach to corridor planning to determine the most appropriate project alignment. Construction of the project would result in direct impacts to around 1,032 hectares of native vegetation, including 22 plant community types (PCT). Four of the 22 PCTs expected to be impacted are listed as threatened ecological communities (TECs) under the *Biodiversity Conservation Act 2016* (BC Act) and three are listed as TECs under the EPBC Act. In addition, construction of the project has the potential to directly impact 33 threatened flora and fauna species, or their habitats.

Indirect impacts during construction, where the project does not physically interfere with threatened species or their habitats, have all been assessed as negligible or low impact except for inadvertent impacts on adjacent habitat or vegetation, and the loss of breeding habitat such as hollow-bearing trees, nests, dreys and burrows and fallen timber, which has the potential to affect native animals within and adjacent to the construction area of the project.

The project would have limited additional or ongoing biodiversity impacts once operational. The key potential operational impacts are associated with the regular management of vegetation in the transmission line easements for safety and operational reasons, including bushfire risk management. The impacts of this activity on biodiversity values has been factored into the construction impact assessment through the predicted impacts to vegetation integrity of PCTs and threatened species habitat. During operation, the potential for collision with transmission lines, and the potential for impacts of electric and magnetic fields (EMF) on local fauna populations has the potential to impact larger and higher-flying birds which occupy the area. While the project is located well away from waterways and major wetlands that would provide habitat for large flocks of water birds, and is likely below the flight path of birds, biodiversity offsets have been calculated for key species.

Habitat connectivity for the Squirrel Glider, threatened woodland birds and threatened bat species also has the potential to be impacted where the transmission line easement intersects areas of native vegetation. However, as the transmission lines would be highly permeable, connectivity is expected to remain largely unaffected for all species and any impacts would be minor. Furthermore, impacts are likely to reduce over time as fauna acclimatises to the presence of the transmission line and towers. In terms of the risk of collision with transmission lines, while this type of indirect impact has the potential to lead to an increase in bird mortality, mitigation measures (including bird flappers/ divertors) would be implemented to ensure the likely impacts are minimised.

Biodiversity offsets would be required for impacts to PCTs, threatened species or populations. The offset obligation for the project has been calculated to require the following biodiversity credits:

- 52,089 species credits
- 21,434 ecosystem credits
- 163 ecosystem credits (scattered trees).

Offsets would be secured in stages to reflect the progressive delivery of the 500 kV and 330 kV transmission lines. The strategy for securing offsets and the proposed delivery approach would be confirmed by EnergyCo during detailed design when the final construction area is confirmed. The final offset requirements would also be confirmed during detailed design.

Aboriginal heritage

The project is located in an area primarily associated with Wiradjuri people, but partially encompasses the southern border of the Gamilaroi nation. The southeastern portion of the project has been extensively studied for over 30 years, largely in response to the development of several major coal mines. More recently, the surrounding area has been broadly studied as part of the development of renewable energy projects in the region.

The Aboriginal cultural heritage assessment involved desktop assessment and comprehensive field investigations. On-site validation of desktop assessment findings consisted of field surveys and test excavations undertaken over a 10 month period by archaeologists, subcontractors and 15 registered Aboriginal parties. Overall, approximately 79 per cent of the construction area was subject to linear pedestrian transects. Test excavations used desktop site predictions and results of field surveys to target key locales to supplement and confirm the field survey findings. The findings of the field investigations demonstrate that the most significant cultural deposits appear to primarily be found along major watercourses and/or strongly influenced by other environmental factors such as the presence of sandstone outcrops and over hangs.

There are several notable areas of Aboriginal cultural heritage value within the vicinity of the project including along the banks of Laheys Creek, the interface between Barneys Reef and the surrounding lowlands near Tallawang, a suite of grinding grooves on discrete sandstone dominated hills in the northwest of Merotherie Energy Hub, and an abundance of diverse sites along Wilpinjong Creek. The project has avoided impacts to some Aboriginal sites identified from desktop assessments or field surveys through relocation and refinement of the construction area as part of the project development process.

There are 46 Aboriginal objects and/or sites within the construction area consisting of eight rockshelters, nine culturally modified trees, 11 grinding grooves, five high density artefact scatters, seven moderate density artefact scatters, six areas of past foci and activity characterised by high densities of sub-surface artefacts. Of these, 17 are previously documented sites, recorded as part of previous studies undertaken within portions of the construction area, and the remaining 29 were identified as part of the various field activities and analysis undertaken as part of this assessment. In addition, zones with archaeological potential occur across the construction area as well as within approximately 150 m either side of moderately size watercourses across the construction area.

All of the Aboriginal sites and places within the construction area have been assessed as potentially subject to direct and indirect impacts from construction and operation of the project resulting in their complete or partial loss. Ground disturbance from construction activities to establish project infrastructure would result in damage to stone artefacts, grinding grooves and rockshelters. Vegetation clearance during construction and operation would primarily directly impact culturally modified trees. Indirect impacts to Aboriginal sites would primarily be as a result of visual impacts associated with establishing new infrastructure in the landscape.

Direct impacts to 37 Aboriginal sites would primarily be caused by ground disturbance which is conservatively assumed to occur throughout the construction area. However, in practice substantial avoidance of heritage sites would be achieved during detailed design through careful siting of the transmission line towers and other project infrastructure. EnergyCo is continuing to explore the potential avoidance of sites of high and moderate significance, and especially where they are located within the energy hubs and workforce accommodation camps. Additional works to further validate and explore the culturally modified trees and cultural deposits would also further refine these values.

Prior to construction, an Aboriginal Cultural Heritage Management Plan sub-plan would be developed by a heritage specialist in consultation with the registered Aboriginal parties to manage and avoid impacts to Aboriginal heritage within the construction area. A heritage-interpretation strategy will also be developed by a heritage specialist to identify the interpretive values of the area and to provide direction for potential interpretive opportunities for the project.

Non-Aboriginal heritage

The project is located in a landscape that retains evidence of the Australian colonial period to the present day. Based on a review of historical aerial mapping, previous heritage studies and field surveys, 24 unlisted heritage items and two locally listed heritage items were identified within and in close proximity to the project. The locally listed heritage items include the Wandoona Homestead and the Goulburn River National Park. The unlisted heritage items consist mainly of potential archaeological sites and homesteads of local heritage significance. Non-intrusive subsurface investigations using Ground Penetrating Radar have been undertaken to locate two potential cemetery areas on the corner of Tucklan and Spir Road in Tallawang. Results from these investigations will be incorporated into the assessment once processing of the investigation data is completed.

The project may result in direct impacts (full or partial disturbance) to 17 locally significant unlisted heritage items located partially or wholly within the construction area. The significance of these impacts would be neutral to slight/moderate. Indirect impacts of neutral/slight significance would occur at one unlisted heritage item and the two locally listed heritage items due to visual impacts arising from the presence of new transmission infrastructure. None of the impacts identified are significant enough to diminish cultural significance in the region to a degree where it is no longer recognisable.

To minimise and manage potential impacts on listed local heritage items and unlisted heritage items within the construction area, a range of mitigation measures would be implemented. Where possible, direct impacts to heritage items would be avoided and minimised through detailed design and tailoring of the construction methodology. If a heritage item cannot be avoided, a number of heritage management actions may be implemented, including archaeological test excavations, salvage or archival recording.

Social

The social impact assessment considered the local social locality (the suburbs expected to experience the most social change due to the project during construction and/or operation) and the regional social locality (the LGAs expected to experience indirect benefits or effects as a result of the project during construction and/or operation). The social impact assessment was informed by the findings of engagement activities conducted broadly by EnergyCo as part of project development, and targeted engagement undertaken for the purposes of this assessment which aimed to gather information from the perspective of those likely to be affected by the project.

Community values are diverse across the local and regional social localities in which the project is located. Based on stakeholder consultation undertaken as part of the social impact assessment, most community members in the region value the views, natural landscape, surroundings and agricultural potential of their properties. Another notable community value that was raised by multiple stakeholders is community cohesion. The rural, close-knit nature of the community is an important aspect of life for residents. Furthermore, the long-standing multi-generational connection many families have to their properties and the local community has also contributed to many residents valuing community cohesion.

Construction activities would result in the generation of noise, vibration and dust, and impacts on visual amenity and landscape character including to nearby residences. These impacts would affect landowners' and the broader community's sense of place and the natural 'peace and quiet' of the surrounding landscape in the local social locality. The potential visual, noise, vibration and air quality impacts of the project associated with construction activities would generally be temporary and short term as work progresses along the transmission line alignments. Potential impacts associated with the construction of energy hubs and switching station sites and use of workforce accommodation camps would persist for the duration of construction.

The most substantial negative social impacts during construction are associated with potential impacts on community cohesion and the ability to make or influence decisions, due to uncertainty around the potential impacts of acquisitions required for the project, and perceptions that there is a lack of detailed information available, and an unequal distribution of impacts and benefits of the project. Other potential negative social impacts may include impacts to local amenity and sense of safety from the introduction of additional traffic and a non-resident workforce in nearby towns. Increased biosecurity threats due to the movement of machinery, vehicles and people may significantly affect livelihoods of agricultural businesses and farmers. There would also be potential impacts on First Nations cultural values and wellbeing due to changes to the landscape, access and sites of cultural heritage significance.

During operation, the project would deliver broader social benefits associated with increased access to renewable energy sources, lowering of carbon emissions and cheaper energy. However, some local residents may experience an unequal distribution of impacts and benefits of the project, or experience stress due to perceived health and safety risks, bushfire risk and uncertainty about the impact of the project on property values. Members of the community that place importance on local landscape value and vistas could experience a diminished sense of belonging due to concerns about potential and perceived visual impacts and industrialisation of the local and regional area (i.e. the cumulative impact of the Central-West Orana REZ).

Mitigation measures would seek to address the potential social impacts of the project and maximise social benefits. Key measures include a project-specific landowner engagement strategy, property management plans, and a local workforce participation strategy (including First Nations participation).

Economic

Construction and operation of the project would provide positive economic activity for the regional and NSW economy. The positive impact of the project on the regional economy during construction is estimated to be up to $512 million in average annual output (the gross value of business turnover in a region). The impacts on the regional economy during project operation are estimated at up to $134 million in average annual output. The economic impacts are larger for the NSW economy because there is a smaller loss of direct and indirect expenditure out of the NSW economy compared to the regional economy.

The construction workforce would vary depending on the stage of construction and associated activities. During the peak construction period, it is expected around 1,800 full time equivalent construction workers would be employed. Increases in labour demand from the project could potentially lead to short term increases in construction wages and associated labour shortages in other areas of the economy. The operation of the project would create a small demand for regional labour resources and regional inputs to production. Consequently, no wage or price increases or production shortages are anticipated.

Construction of the project would result in a reduction in the land available for agricultural activity. The agricultural impacts of the project during construction are less than 0.3 per cent of agricultural economic activity in the region and a fraction of the economic activity gains from the project. Following construction, the project would result in a smaller reduction in agricultural land due to the comparatively smaller operational area.

Noise and vibration

The project is located in areas where background noise levels were generally measured to be low during the daytime period and dominated by rural and natural sounds, typical of the rural land uses.

During construction, noise impacts would generally be minor during standard work hours; however, the project has the potential to impact noise sensitive receivers (generally residences) in the vicinity of the project due to noise or vibration intensive activities such as earthworks. At energy hubs and switching stations, airborne noise impacts would be minor for most construction activities with exceedances of noise criteria predicted to occur at 14 receivers. Where construction works are carried out outside of standard working hours, noise levels are predicted to be more noticeable and result in exceedances of criteria for some activities. Typically, foundations and/or earthworks are expected to be the loudest out of hours work stage at most sites and this work would be avoided during night-time periods where reasonable and feasible.

Potential noise impacts during construction of the transmission lines are predicted to occur at 144 receivers, primarily as a result construction of the transmission line tower foundations undertaken outside of standard hours (including the daytime periods of Saturday afternoons and Sundays). Use of drones or helicopters for stringing transmission lines between towers may be required for short periods and would progress along the alignment. Where required, this activity would result in exceedances of noise criteria during the daytime (including outside of standard hours daytime) as noise levels would be approximately four decibels (dB) greater than the noisiest earthworks. This activity would not be undertaken during evening or night-time hours.

These impacts would generally be transient, as work moves along the transmission line alignment and impacts are not generally predicted to impact most receivers for any substantial length of time. Implementation of standard and site-specific noise and vibration mitigation measures would be implemented to reduce the impact on receivers.

Construction vehicles would generate road traffic noise along construction routes. Around 32 receivers are predicted to exceed construction traffic noise criteria, particularly during the night time on local roads, due to the existing low traffic volumes and the relative increase of traffic from the project. However, construction traffic movements would generally occur during daytime hours such that night time impacts are limited. Noise management measures would be implemented to minimise the potential for noise disturbance from construction traffic including limiting traffic movements to daytime periods as far as reasonable and feasible.

Noise would be generated from the operation of energy hubs, switching stations and transmission line infrastructure and maintenance activities once the project has been commissioned. Operational noise impacts from maintenance and inspection activities would be infrequent and short lived. Noise impacts from operation of the transmission line, associated with corona noise discharges, have been predicted to potentially affect up to two sensitive receivers. This corona discharge noise is more prominent during rain, mist or fog and often sounds like a ‘crackling noise’. Three sensitive receivers near switching stations are also predicted to be affected by infrequent and brief noises from circuit breaker switches.

Due to the rural nature of the area and generally isolated nature of noise-sensitive receivers, receiver-based noise treatment(s) are considered feasible and reasonable to manage potential audible noise impacts from the operation of transmission lines. During detailed design and upon completion of a comprehensive assessment of feasible and reasonable mitigation options, residual impacts would be further considered to determine what appropriate mitigation treatments may be required. This includes monitoring after the commissioning of the project at each residence where potential operational noise levels are predicted to exceed project noise trigger levels. At-property treatments would need to be determined in consultation with the landowner and informed by a detailed building condition survey.

Hazard and risk

Potential hazards and risks associated with project which have been identified and assessed include:

- bushfire
- mine subsidence
- aviation safety
- the on-site storage, use and transport of dangerous goods and hazardous materials
- impacts to utilities
- electric and magnetic fields from transmission infrastructure
- the on-site storage, use and transport of dangerous goods and hazardous materials
- telecommunications inference.

Potential hazards and risks during construction of the project would be temporary and associated with the dangerous goods and hazardous materials for construction, activities within mine subsidence risk areas, aviation safety around cranes, drones and helicopters, impacts to existing utilities, and bushfire risks as a result of construction or from external sources. Emergency and incident response plans and procedures would be developed and implemented as part of the Construction Environmental Management Plan (CEMP) for the project, including a Bushfire Emergency Management and Evacuation Plan.

Potential hazards and risks during operation of the project are associated with bushfire, electric and magnetic fields, mine subsidence, aviation safety, interference with telecommunications, and the operational fire or electrical exposure at the potential battery energy storage system at Merotherie Energy Hub. These operational hazards and risks would be primarily managed through continued development of the design of the project in accordance with relevant standards, guidelines and codes, where applicable.

During operation, ignition of bushfires has the potential to occur during maintenance of the project infrastructure and from operation the infrastructure itself such as from lightning strike or electrical fault. Asset protection zones (APZs) with specific vegetation clearing regimes and transmission line easements managed as APZs would be established within the operation area to minimise the risk of ignition from project infrastructure and risk to infrastructure from bushfires. It was noted in a recent Standing Committee on State Development held by the Parliament of NSW on the feasibility of undergrounding the transmission infrastructure for renewable energy projects (Parliament NSW, 2023) that the risk of a bushfire being ignited by high voltage transmission lines is low.

Electric and magnetic fields would be produced by electrical current moving through the project infrastructure. The modelled electric and magnetic fields levels at the boundary of the operation area are compliant with the reference levels within which a person may be exposed without an adverse health effect and with acceptable safety factors. Therefore no mitigation or modifications in regard to electric and magnetic fields are proposed for the project.

Traffic and transport

The road network to be used for the construction and operation of the project reflects the predominately rural nature of the locality. Key roads comprise highways, state roads, regional roads and local roads that connect population centres, mining sites and residential properties with a network of sealed and unsealed roads.

During peak construction periods, the contribution of construction vehicles would bring a noticeable change to local roads that currently carry low volumes of traffic. The volume of construction vehicles on construction routes would vary according to the type and location of construction activity at any given time in the construction period. As these roads have sufficient spare capacity, the project would only have a minor impact on the efficiency and capacity of the road network with most roads continuing to operate with a similar level of service when compared to existing traffic conditions.

Adjustments to four intersections may be required to provide additional turning capacity as a result of increased vehicular movements during construction, being the Neeleys Lane/Ulan Road, Golden Highway/Ulan Road, Merotherie Road/Golden Highway and Spring Ridge Road/Dapper Road intersections. The need for these adjustments would be confirmed during detailed construction planning and based on final workforce numbers. The existing configuration of the Ulan Road/ Cope Road intersection is under designed for current traffic volumes. Construction vehicle movements during peak morning and afternoon periods at this location would be minimised to avoid the need to adjust this intersection.

Oversize and over mass (OSOM) movements would be required to deliver certain plant and equipment to the energy hubs and New Wollar Switching Station during construction. Approval for these movements would be obtained from the National Heavy Vehicle Regulator (NHVR) prior to any movements occurring, noting the last sections of the construction routes to energy hubs are not gazetted for OSOM use. These roads and intersections are intended to be upgraded as part of an early works package (subject to separate approvals) and would cater for OSOM deliveries for the project.

The anticipated impact of construction traffic on road pavement conditions is considered to be minor. Heavy vehicles would likely have a larger impact on pavement conditions than light vehicles; however, the impact would depend on the existing pavement condition, and remaining life of the pavement in combination with traffic numbers using the pavement. Pre-condition surveys would be completed before construction, and any required rectifications works would be completed in consultation with the relevant council.

Construction vehicle movements would increase the number of road users on the road network which introduces additional risks associated with movements in/out of multiple construction access points. There is also the potential for driver fatigue given the distances covered by construction routes. These risks would be addressed through physical (such as signage and other traffic management controls) and behavioural measures (such as a Code of Conduct and fatigue management). There would be interaction between construction routes and a section of the Central West Cycle trail, a trail formed by around 400 kilometres of backroads in the region. Approaches would be implemented in liaison with the cyclist group, Mid-Western Regional Council and Warrumbungle Shire Council to manage any interactions with cyclists along these roads.

Impacts to property access would be managed in consultation with affected property owners, and temporary alternative access arrangements provided where required.

During operation, the project would have negligible impacts on the transport network and other road users (such as public and active transport). Routine inspection and/or maintenance of the project by staff and contractors would occur infrequently and would generate minimal traffic.

Waste management

The project has been designed, as far as practicable, to minimise the generation of waste through developing a project design which minimises excavation, an alignment which minimises demolition and a construction methodology which maximises the reuse of materials. Waste generated during construction of the project would mainly consist of spoil (excavated material), vegetation, demolition waste and other construction wastes such as concrete, steel and timber. Waste measures would be implemented under the CEMP for the project, which would include the implementation of waste targets, requirements for waste segregation, and waste mitigation and management measures for the waste types and quantities.

Local waste management facilities closest to the project may have limited or no capacity to accept construction waste from the project. If closer (but generally smaller) local facilities are unable to accept the waste quantities from the project, there may be a requirement to transport the waste generated by construction of the project to larger regional facilities located further away from the construction area. EnergyCo will explore further opportunities with Mid-Western Regional, Dubbo Regional, Warrumbungle Shire and Upper Hunter Shire councils to reduce the demand placed on local waste management facilities as a result of the project.

Minor quantities of waste would be generated during operation of the project due to periodic maintenance activities and would be managed in accordance with established mitigation and management measures.

Other issues

Hydrology, water quality and flooding

The project is located across the Macquarie River and Hunter River catchments. Numerous natural watercourses intersect the project, including perennial and ephemeral watercourses and unnamed drainage lines. Impacts to water quality and flood extents due to construction activities and operation would be minimal and manageable through the implementation of mitigation measures.

Construction water would be obtained from a variety of sources according to a water supply hierarchy, with rainwater harvesting and re-use of treated mine water and construction water being the preferred sources. After these sources, existing unregulated surface water sources would be considered. The availability of water from the Upper and Lower Talbragar Rivers would be limited by the preceding rainfall, and peak demands by the project would impact on the available water supply volumes. Opportunities to use other non-potable water supply options would continue to be explored by the project to lessen this demand.

Soils and contamination

The construction area is mostly used for agricultural purposes and the risk of encountering and disturbing contaminated soils and groundwater is generally low for most of the construction area. The exception is where the project intercepts mining areas and rehabilitation areas at Moolarben Coal Mine and Wilpinjong Coal Mine, respectively which present a low to high contamination risk, and farm dams within the construction area, which present a medium risk for isolated contamination, should they be impacted. Further investigation in medium to high risk contamination areas would be undertaken and relevant mitigation measures implemented prior to disturbance during construction.

There is a general risk for the construction of the project to result in the contamination of soil and/or groundwater due to accidental spills or releases of dangerous goods, hazardous materials and waste material. This risk is considered low and manageable through the implementation of standard environmental management measures as part of the CEMP.

The operation of the project is not likely to result in any significant impact on soils or contamination. Controls would be in place to manage any accidental release of fuels or chemicals, and ongoing operations and maintenance activities are unlikely to involve substantial ground disturbance activities.

Groundwater

In the event surface water availability does not meet the project's non-potable water requirements during construction, groundwater would be considered as a source in accordance with the water supply hierarchy. New bores established at the Merotherie and Elong Elong energy hubs would potentially supply up to 124 megalitres of water over the four years. This extraction would not exceed the criteria specified for the groundwater source. Groundwater extraction is not proposed during operation.

Construction and operational activities would not result in permanent inflow or take of groundwater. The project is predicted to generally have a limited impact to groundwater, which would be further reduced with the implementation of mitigation measures outlined within the CEMP and the soil and water management sub-plan.

Air quality

Construction of the project would generate dust emissions as a result of earthworks, civil construction activities and movement of construction vehicles along the public road network (referred to as track out). Dust impacts from construction activities such as earthworks were determined to present a negligible to low risk at nearby sensitive receivers prior to mitigation. Construction vehicle movements on paved and unpaved local public roads beyond the immediate vicinity of site access points can also lead to amenity impacts to nearby sensitive receivers due to dust.

During operation, air quality emissions would be associated with maintenance and routine inspections (dust, vehicular/plant emissions), dust emissions from unsealed access tracks and insulating gas emissions from electrical equipment. Any such emissions would be low and not of significance.

Climate change and greenhouse gases

Climate change is projected to result in an increase of extreme weather conditions including of flooding, increased rainfall, extreme heat, droughts, storms and bushfire. The increase of extreme weather conditions has the potential to impact project infrastructure. Project infrastructure would be subjected to low to medium exposure to extreme heat events, low to medium exposure to flooding risk and low to high exposure to bushfire risk. A detailed climate change risk assessment will be carried out during further design development with consideration of climate change adaptation measures.

The greenhouse gas emissions from construction of the project are estimated to be a total of 611,607 tonnes of carbon dioxide equivalent. The embodied emissions within materials that would be produced for the project are estimated to be the largest contributor (94 per cent) during construction. There would also be greenhouse gas emissions during the operation of the project. However, the project would have an overall benefit in reducing greenhouse gas emissions in the wider economy by enabling an increase in the generation of renewable energy in the grid, to replace carbon intensive fossil fuel generation.

Cumulative impacts

Within the Central-West Orana region, a significant number of new developments are proposed, approved or under construction, including more than 30 major renewable energy generation and storage projects (of which 11 would connect to this project), as well as other infrastructure and mining projects. These developments are expected to result in substantial investment, economic benefits and job opportunities in the region, however, would also place pressure on existing communities and services such as accommodation, health services, retail, hospitality and emergency services and waste facilities. Development of these projects would also have the potential for cumulative amenity impacts associated with visual, traffic, noise and air quality impacts during construction and operation.

The most substantial cumulative impacts of this project, in combination with the relevant future projects, are associated with:

- land use, property and agriculture
- landscape character and visual amenity
- biodiversity
- Aboriginal heritage
- socio-economic
- noise and vibration.

The approach taken to the assessment of cumulative impacts acknowledges that each project will be required to mitigate its own impacts to acceptable levels, minimising the overall contribution to cumulative impacts. However, it is also recognised that not all REZ related cumulative impacts can be addressed through a project level approach alone, requiring a more strategic and collaborative approach between EnergyCo, renewable energy developers, councils and government agencies.

Over the last 12 months, EnergyCo has consulted with the community, councils and other government agencies on studies to inform how cumulative impacts in the Central-West Orana REZ will be managed. Given the scale and complexity of the task, work undertaken to date has focussed on data gathering to establish baseline information such as existing levels of service provision (e.g. medical services and waste infrastructure) and identify potential cumulative impacts. This has provided an important evidence base to identify potential measures to manage cumulative impacts and to ensure they are targeted, coordinated and complement existing commitments and policy directions.

The next stage involves the establishment of working groups involving representatives from councils, agencies and EnergyCo to assess and prioritise recommendations, including the identification of funding sources and lead agency responsibilities and implementation timeframes. The outcomes of this next stage will be documented in an Implementation Plan by the end of 2023.

Mitigation and management

EnergyCo will appoint a Network Operator to design, build, operate and maintain the project. The proposed Network Operator would be required to have an environmental management system that is ISO 14000 accredited.

Should the project be approved, the environmental performance of the project would be managed in accordance with:

- the environmental management systems and procedures of the Network Operator
- the design of the project as described in this EIS
- the mitigation measures identified in this EIS
- the conditions of approval and other licences, permits and consents granted for the project
- the CEMP
- an Operational Environmental Management Plan (or equivalent).

Justification and conclusion

A project of this scale and geographical spread would inevitably have impacts on the local environment and community, particularly during construction. The most significant impact to the environment would likely be on biodiversity due to the extent of the vegetation clearing that would be required. The most significant impacts to the community would likely be from changes to existing land use, in particular the loss of agricultural land, and amenity impacts, in particular visual impacts from the introduction of new large scale infrastructure into the landscape.

A range of mitigation measures identified in Chapters 7 to 20 of this EIS would be implemented during construction and operation of the project to manage and minimise the potential impacts of the project. The residual impacts of the project would be outweighed by the benefits, including:

- supporting the transition of the NEM from traditional energy sources to lower emission alternatives based on renewable energy
- facilitating the development of the Central-West Orana REZ to meet current bulk energy demands and enable efficient expansion to meet future demand
- creating job opportunities throughout the project life-cycle with up to 1,800 workers required during construction.

During the continued development of the design and the construction methodology, opportunities to further minimise potential impacts would be sought and ongoing input from stakeholders and the community would be, taken into account. The potential residual construction and operational impacts of the project are considered manageable with the implementation of the proposed mitigation and management measures.

Next steps

This EIS will be publicly exhibited for a minimum of 28 days and during this time government agencies, stakeholders and the community will have the opportunity to make a written submission to the DPE for consideration in its assessment of the project.

To support public exhibition and provide opportunities for the community and stakeholders to ask questions, and find out more information before making a submission, a range of consultation and communication tools will be used by EnergyCo including community information sessions during the exhibition period.

When the public exhibition period of the EIS has closed, DPE will collate and provide EnergyCo with a copy of all submissions received. EnergyCo will consider and take into account these submissions, and then prepare a subsequent report responding to any issues raised. The submissions report will be made publicly available on the DPE Major Projects website.

If required, an amendment report or preferred infrastructure report may also be prepared. If prepared, this will be submitted to DPE alongside the Submissions Report.

Declaration

The project:	
Project name	Central-West Orana Renewable Energy Zone Transmission project
Application numbers	SSI-48323210 EPBC 2022/09353
The land on which the infrastructure is to be carried out	Generally the land which comprises a corridor approximately 220 kilometres long extending north to south from Cassilis to Wollar and east to west from Cassilis to Goolma.

Proponent:	
Name	Energy Corporation of New South Wales
Address	GPO Box 39, Sydney NSW 2001

Person by whom this EIS was prepared:	
Name	Caitlin Bennett
Address	Level 25, 680 George Street, Sydney
Professional qualifications	Bachelor of Science (Environmental Biology) Master of Urban and Regional Planning

Declaration by registered environmental assessment practitioner:	
Name	Paul Greenhalgh
Address	Level 25, 680 George Street, Sydney
Professional qualifications	Bachelor of Science (Honours) (Agricultural and Environmental Science) Master of Science (Town and Country Planning)
Registration number	R80047
Organisation registered with	EIANZ

Declaration

The undersigned declares that this Environmental Impact Statement (EIS):

- has been prepared in accordance with the Environmental Planning and Assessment Regulation 2021
- contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates
- does not contain information that is false or misleading
- addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project
- identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments
- has been prepared having regard to the Department's State Significant infrastructure Guidelines - Preparing an Environmental Impact Statement
- contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development
- contains a consolidated description of the project in a single chapter of the EIS
- contains an accurate summary of the findings of any community engagement
- contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.

Signed:

Date: 21 September 2023

Glossary

Term	Definition
Access road	Permanent access roads to switching stations and energy hubs.
Access track	Temporary and permanent access tracks to transmission lines.
Central-West Orana Renewable Energy Zone	A geographic area of approximately 20,000 square kilometres centred on the regional towns of Dubbo and Dunedoo and extending west to Narromine and east beyond Mudgee and to Wellington in the south and Gilgandra in the north, that will combine renewable energy generation, storage and transmission infrastructure to deliver energy to electricity consumers.
Construction area	The area that would be directly impacted by the construction of the project, including (but not limited to) transmission towers and lines, brake and winch sites, access roads to the switching stations and energy hubs, access tracks, energy hubs, switching stations, communications infrastructure, workforce accommodation camps, construction compounds, laydown and staging areas.
Construction compound	An area used as the base for construction activities, usually for the storage of plant, equipment and materials, and/or construction site offices and worker facilities. It can also comprise concrete batching plant, crushing, grinding and screening plant, testing laboratory and wastewater treatment plant.
Construction routes	Roads used by construction vehicles (light and heavy).
Consumer Trustee	The *Electricity Infrastructure Investment Act 2020* (NSW) establishes the NSW Consumer Trustee as an independent statutory role with various planning, advisory and procurement functions which must be conducted in the long-term financial interests of NSW electricity customers. Australian Energy Market Operator services, as the NSW Consumer Trustee, runs competitive tenders for Long-Term Energy Services Agreements and Renewable Energy Zone Access Rights to support investment, construction and operation of renewable energy generation and long duration storage infrastructure in NSW.
Double circuit transmission lines	Transmission lines which typically comprise three conductors along with earthing and communications wires, carried by a single tower set. For 330 kilovolt (kV) lines, each conductor typically comprises two conductor cables (six conductor cables in total).
Enabling works	Activities that would be carried out before the start of substantial construction in order to make ready the key construction sites (including workforce accommodation camps and compounds), facilitate the commencement of substantial construction, manage specific features or issues and collect additional information required to finalise the final design and construction methodology.
Energy hub	A substation where energy exported from renewable energy generation projects is aggregated, transformed to 500 kV (where required) and exported to the transmission network, and may include battery storage.
EnergyCo	The Energy Corporation of New South Wales constituted by section 7 of the *Energy and Utilities Administration Act 1987* as the NSW Government statutory authority responsible for the delivery of NSW's Renewable Energy Zones.
Operation area	The area that would be occupied by permanent components of the project and/or maintained, including transmission line easements, transmission lines and towers, energy hubs, switching stations, communications infrastructure, access roads to the switching stations and energy hubs, maintenance facilities and permanent access tracks to the easements.
The project	The Central-West Orana REZ Transmission project as described in this EIS.
Renewable Energy Zone	A geographic area identified and declared by the NSW Government as a Renewable Energy Zone.

Term	Definition
Single circuit transmission lines	Transmission lines which typically comprise six conductors along with earthing and communications wires, paired on each phase, carried by a single tower set. For 500kV lines, each conductor typically comprises four conductor cables (24 conductor cables in total). For 330 kV lines, each conductor typically comprises two conductor cables (12 conductor cables in total).
Substation	A facility used to increase or decrease voltages between incoming and outgoing transmission lines (e.g. 330 kilovolts to 500 kilovolts).
Switching station	A facility used to connect two or more distinct transmission lines of the same designated voltage.
Transmission line easement	An area surrounding and including the transmission lines which is a legal 'right of way' and allows for ongoing access and maintenance of the transmission lines. Landowners can typically continue to use most of the land within transmission line easements, subject to some restrictions for safety and operational reasons
Transmission tower	A free-standing steel lattice tower (tension tower or suspension tower) or monopole.
Twin transmission lines	A pair of single or double circuit transmission lines running parallel.
Workforce accommodation camps	Areas that would be constructed and operated during construction to house the construction workforce.

Abbreviations

Term	Definition
ABS	Australian Bureau of Statistics
AC	Alternating Current
ACHA	Aboriginal Cultural Heritage Assessment
ACHMP	Aboriginal Cultural Heritage Management Plan
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
AER	Australian Energy Regulator
AFG	Aboriginal Focus Group
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ALA	Aircraft Landing Areas
ANZECC	Australian and New Zealand Environment Conservation Council
ANZS	Australian and New Zealand Standard
ANZSIC	Australian and New Zealand Standard Industrial Classification
APZ	Asset Protection Zone
ARI	Average Recurrence Interval
ARMCANZ	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AUL	Auxiliary Left Turn
AVTG	Assessing Vibration: A Technical Guideline
BAL	Bushfire Attack Level
BAM	Biodiversity Assessment Method
BCS	Biodiversity Conservation and Science
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BOM	Bureau of Meteorology
BSAL	Biophysical Strategic Agricultural Land
CASA	Civil Aviation Safety Authority
CEC	Clean Energy Council
CEMP	Construction Environmental Management Plan
CMSC	Coal Mine Subsidence Compensation
CNVG	Construction Noise and Vibration Guideline
CNVMP	Construction Noise and Vibration Management sub-plan
CSSI	Critical State Significant Infrastructure
CTF	Controlled Traffic Farming

Term	Definition
DA	Development application
DC	Direct Current
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DIDO	Drive-n-Drive-Out
DISER	Department of Industry, Science, Energy and Resources
DPI	Department of Primary Industries
DPE	Department of Planning & Environment
EIS	Environmental Impact Statement
EMF	Electric and Magnetic Field
EP&A Act	*Environmental Planning and Assessment Act 1979 (NSW)*
EPA	NSW Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*
EPI	Environmental Planning Instruments
ESD	Ecological Sustainable Development
FCNSW	Forestry Corporation NSW
FIFO	Fly-In-Fly-Out
FM Act	*Fisheries Management Act 1994 (NSW)*
GDE	Groundwater Dependant Ecosystems
GPS	Global Positioning System
GRIT	Generation of Regional Input Output Tables
HHMP	Historical Heritage Management Sub-Plan
HV	High Voltage
ICNG	Interim Construction Noise Guideline
ICNIRP	International Commission for Non-Ionizing Radiation Protection
ICOMOS	International Council on Monuments and Sites
IDA	International Dark Sky Park
IRSAD	Index of Relative Socio-economic Advantage and Disadvantage
ISP	Integrated Systems Plan
IVMS	In-Vehicle Monitoring System
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Areas
LLS	Local Land Services
LLS Act	*Local Land Services Act 2013 (NSW)*
LSC	Land and Soil Capability assessment scheme
MCP	Moolarben Coal Project
MDB	Murray-Darling Basin
MNES	Matters of National Environmental Significance

Term	Definition
NASAG	National Airports Safeguarding Advisory Group
NEM	National Energy Market
NHL	National Heritage List
NHVR	National Heavy Vehicle Regulator
NML	Noise Management Level
NP&W Act	*National Parks and Wildlife Act 1974 (NSW)*
NSW	New South Wales
NTSCORP	Native Title Service Provider for Aboriginal Traditional Owners in New South Wales and the Australian Capital Territory
OEH	Office of Environment and Heritage (former)
OEMP	Operational Environmental Management Plan
OJD	Ovine Johns Disease
OLS	Obstacle Limitation Surfaces
OOHW	Out of Hours Works
OSOM	Oversize and overmass
PAD	Potential Archaeological Deposits
PCT	Plant Community Type
PNTL	Project Noise Trigger Level
POEO Act	*Protection of the Environment Operations Act 1997 (NSW)*
QLD	Queensland
RAV	Restricted Access Vehicles
RBL	Ratings Background Levels
REZ	Renewable Energy Zone
RFS	Rural Fire Service
RNP	NSW Road Noise Policy
SBP	Strategic Benefit Payment
SEAR	Secretary's Environmental Assessment Requirement
SEPP	State Environmental Planning Policy
SES	State Emergency Services
SF6	Sulfur hexafluoride
SIA	Social Impact Assessment
SIMP	Social Impact Management Plan
SMS	Safety Management System
SSAL	State Significant Agricultural Land
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
TRRA	Three Rivers Regional Assembly
TSR	Travelling Stock Reserve

Term	Definition
UNESCO	United Nations Educational, Scientific and Cultural Organization
WAL	Water Access Licence
WARR Act	*Waste Avoidance and Resource Recovery Act 2001 (NSW)*
WHL	World Heritage List
WHS	Work Health and Safety
WM Act	*Water Management Act 2000 (NSW)*