MBB Group

Supply Chain Analysis Report

NSW Electricity Infrastructure

NSW Department of Planning, Industry and Environment

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1 Executive Summary

The NSW Government's Electricity Infrastructure Roadmap November 2020 (Roadmap) is a coordinated framework to deliver a sustainable and flexible electricity system for NSW. This coordinated approach to transmission, generation, storage and firming will deliver approximately 12 gigawatts of equivalent renewable generation capacity across five Renewable Energy Zones (REZs) in the Central West Orana, New England and Southwest regions by 2030[1], with additional REZs announced for the Hunter and Illawarra regions.

This report seeks to identify:

- A sustainable pipeline of electricity infrastructure projects in NSW over the next 10 years
- Potential market constraints and dependencies in delivering the pipeline
- Opportunities for local content in the renewable energy sector supply chain and interventions that Government could employ to maximise the use of locally produced and supplied goods and services and maximise the employment of suitable qualified local workers.

This analysis is informed by market engagement with representative participants from a cross section of the renewable energy supply chain[2] and desktop research of initiatives in similar jurisdictions presented as case studies[3].

1.1. NSW Electricity Infrastructure Pipeline[4]

To analyse the scale and timing of the proposed pipeline of investment, MBB Group (MBB) developed a model that forecasts the potential construction spend each financial year from 2021 to 2030. Inputs and calculations were analysed with the Department's Data and Analytics Team, Consumer Trustee and REZ Team to ensure alignment with current thinking around the planned rollout of the Roadmap. Two scenarios were examined:

1. Staged Rollout: Timing of development of each REZ is managed to produce an even spend profile shown in Figure 1
2. Back-Ended Rollout: Timing to reflect the likely AEMO recommendation that is, from a network perspective, most of the generation and storage investment is not required until close to 2030, shown in Figure 2.

[1] Source: https://www.energy.nsw.gov.au/government-and-regulation/electricity-infrastructure-roadmap

[2] Found at **Appendix 5**

[3] Found at **Appendix 4**

[4] Found at Section 3

Figure 1: Major Electricity Projects (NSW), Constant FY2020 Prices – Staged Rollout

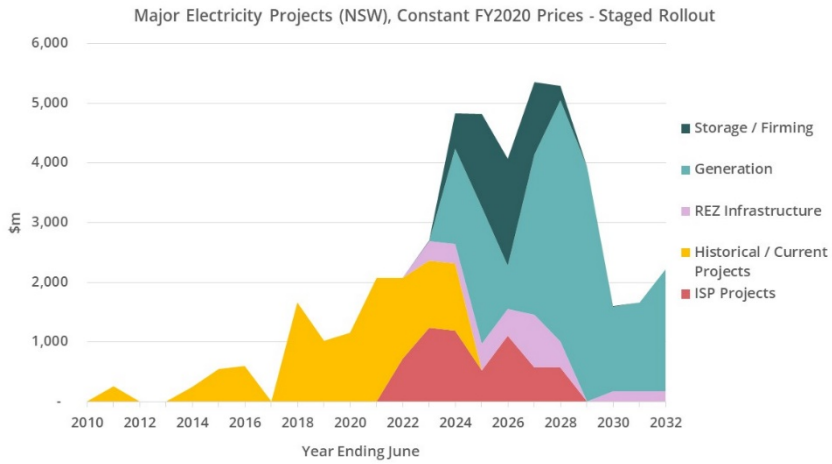
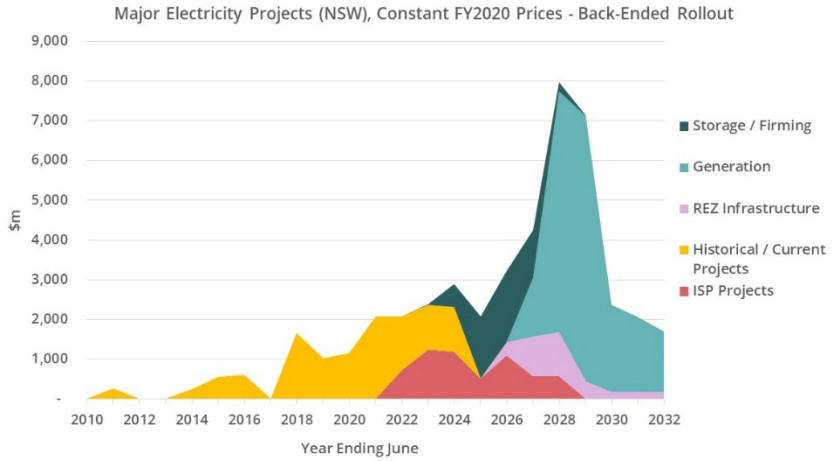


Figure 2: Major Electricity Projects (NSW), Constant FY2020 Prices – Back Ended Rollout



1.2. Transport Infrastructure Pipeline[5]

Many of the top tier contractors that undertake electricity infrastructure construction are also involved in delivering other major civil works across the transport, water and mining sectors[6]. When these other sectors have capacity constraints, there will be flow-on impacts on the capacity to construct electricity infrastructure, especially where there are common skills used such as civil engineering construction because of the shared workforce.

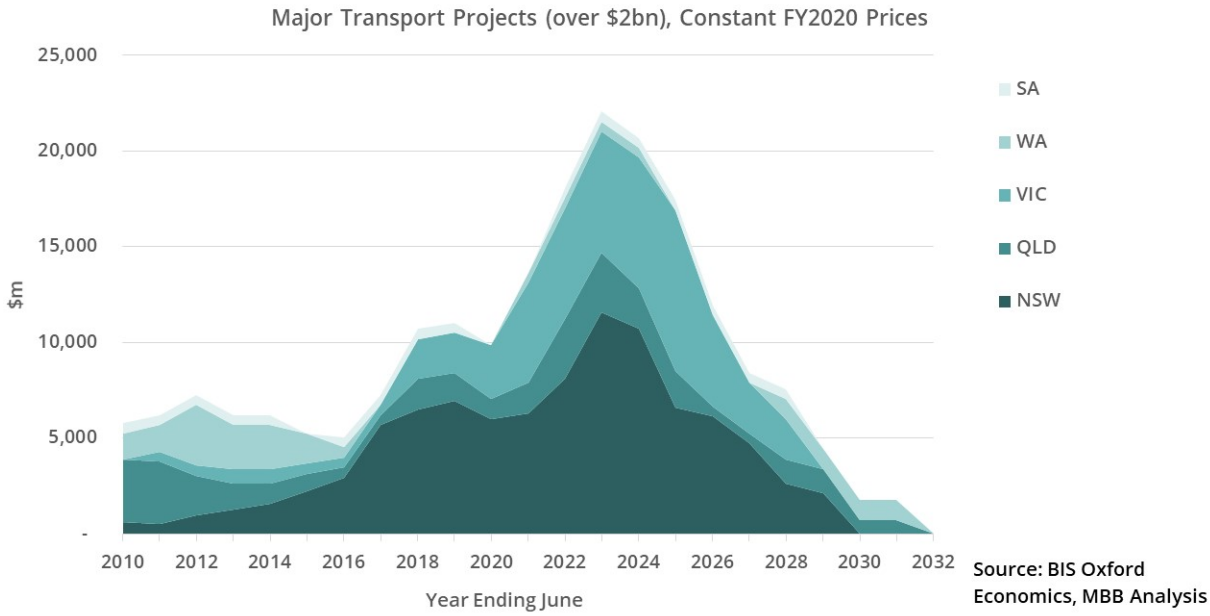
Based on desktop research, MBB developed an investment pipeline for the transport sector, being the largest civil construction sector competing with the electricity infrastructure pipeline. This is shown in Figure 3.

[5] Found at Section 4

[6] For example, CPB, UGL, Downer, Clough, Acciona

In the next 5 years, there will be a large peak in committed investment in transport across Australia at the same time as the Roadmap investments are planned.

Figure 3: Transport Spend Profile by State, Constant FY2020 Prices



Source: BIS Oxford Economics, MBB Analysis

1.3. Research Undertaken[7]

1.3.1. Market Engagement[8]

A market engagement process was undertaken to consult with a cross section of the electricity infrastructure industry to identify constraints, risks and opportunities faced by the suppliers in delivery of the Roadmap.

1.3.2. Case Studies[9]

Using publicly available sources, MBB researched recent comparable case studies across both international and domestic jurisdictions. The case studies developed are:

- BHP Local Buying Program
- Denmark: Local Value Creation
- Government of Ontario Canada Long Term Infrastructure Plan

[7] Found at Section 5

[8] Details of the market engagement process, questionnaire and key findings are set out in **Appendix 5**

[9] The Case Study Report found at **Appendix 4** summarises key findings and recommendations to sustainably achieve the Roadmap objectives.

- IRENA Leveraging Local Capacity – Renewable Energy: Onshore Wind
- OECD Developing Robust Project Pipelines for Low-Carbon Infrastructure
- Snowy Hydro 2.0 Polo Flats Concrete Segment Factory
- Victorian Government Local Steel Pledge
- Bankwest Stadium Local Steel
- ACT Government Renewable Energy Program

1.3.3. Supply Chain Diagrams

Based on the market engagement, case studies and desktop research conducted by MBB, the supply chain for each of the major renewable energy sectors (Battery / Pumped Hydro / Solar PV Generation / Transmission / Wind Generation) is shown diagrammatically in **Appendix 1**.

1.4. Potential Market Constraints[10]

Based on MBB's knowledge of major infrastructure markets, outcomes from the market engagement[11] and the Case Study Report[12], the constraints faced by each market segment have been identified and summarised in Table 1. MBB also undertook an analysis of the potential development pathway for the Roadmap.

Table 1: Potential Market Constraints

SUPPLY CHAIN SEGMENT	POTENTIAL MARKET CONSTRAINTS
DEVELOPERS	• Market engagement feedback indicated that risk allocation is a key consideration for developers, particularly the ability and cost to connect to the electricity grid and obtain registration
CONTRACTORS	• Constraints for contractors typically fall into two areas: – **Workforce**: the ability to source an appropriately skilled workforce to manage and undertake the works – **Financial capacity**: Many construction contracts involve provision of financial guarantees that are supported by the company's balance

[10] Found at Section 6
[11] Found at **Appendix 5**
[12] Found at **Appendix 4**

SUPPLY CHAIN SEGMENT	POTENTIAL MARKET CONSTRAINTS
	sheet. As such, each contractor will only be able to support a limited number of projects simultaneously due to their balance sheet capacity • Currently construction contractors are extremely busy due to the large infrastructure pipeline, leading to constraints across both workforce and financial capacity. This is evidenced by cost increases[13] and contractors pulling out of projects where risk allocation is untenable[14]
MANUFACTURERS	• For large electrical components, a factory production 'slot' needs to be booked in advance (up to 12 months) to ensure program certainty • One area of risk is around concentration of suppliers in a limited number of companies and countries, which can result in disruption to the supply chain from unexpected events • Some domestic facilities are set up to assemble imported components rather than manufacture or produce locally - audits or monitoring will be required to ensure that local content requirements are met • Market engagement indicated that cost and availability of shipping to transport key items to Australia is currently extremely constrained • As global commitments to introduce renewable energy increase, demand for rare earth elements will also increase, potentially leading to shortages or increases in cost for these raw materials
ADVISORS	• Generally, no constraints however electrical engineers with experience modelling high voltage networks have been identified in the market engagement as a key area where there is a shortfall in capability / capacity in Australia
FINANCIERS	• Generally, no constraints however risk allocation needs to be attractive for investors

[13] For example: https://infrastructuremagazine.com.au/2020/02/21/nsw-government-confirms-3-billion-sydney-metro-cost-blowout/

[14] For example: https://www.theage.com.au/national/victoria/building-consortium-set-to-withdraw-bid-for-north-east-link-20191220-p53lur.html

SUPPLY CHAIN SEGMENT	POTENTIAL MARKET CONSTRAINTS
APPROVALS / CONNECTIONS	• Implementing the Roadmap will result in a significantly higher volume of connection agreements and registrations to be processed by AEMO / TransGrid, which could lead to delays for development of projects • Implementing the Roadmap will result in a significantly higher volume of planning and environmental approvals to be processed by DPIE, which could introduce delays for development of projects

1.4.1. Preferred Development Pathway

Given the overlap of committed transport construction and planned electricity infrastructure investment shown in Figure 6, there is a risk that the market will not meet Roadmap demand within required timeframes without Government interventions. Government should therefore consider market capacity when structuring the development pathway for the Roadmap to meet policy objectives[15].

The preferred development pathway is the Staged Rollout shown in Figure 1 as it builds investment gradually, and then a plateau is maintained until all investment under the Roadmap is complete. Investment is ramped up over 2 years to reach a level of $4 billion to $5 billion per year from 2024 to 2029. The key factors to consider when setting this approach are:

- Investment in transmission should commence as soon as practically possible. Completion of transmission is the key to allowing investment in generation and storage to commence
- Transmission projects should be rolled out sequentially to allow developers / contractors to focus on bidding for a single project at a time and reduce the peak capacity required in the transmission construction industry
- Connections / registrations for generator and storage developers should be rationed (for example by releasing a certain amount of capacity each year through reverse auctions). This will allow government to control the level of investment to produce a more optimal profile

1.5. Supply Chain Opportunities[16]

Market engagement[17] investigated the capability, capacity and cost effectiveness of the local supply chain. Based on market feedback, opportunities for development of locally supplied goods have been identified and are shown in Table 2.

[15] See Objects of *Electricity Infrastructure Act 2020*

[16] Found at **Section 7**

[17] Found at **Appendix 5**

Table 2: Local Supply Chain Opportunities

Opportunities for Development	
SOLAR GENERATION	**TRANSMISSION NETWORK**
• Steel Tracker Frames • Tracking Motors • Steel Foundation Pile • Low Voltage Cabling • Piling and Trenching Machinery • Offsite Prefabrication of Arrays	• Lattice Towers • Guyed Towers • Monopoles • Low Voltage Cabling
WIND GENERATION	**BATTERIES**
• Wind Towers[18] • Nacelles • Noise Monitoring Equipment	• Inverter Skids • Battery Cell Module
PUMPED HYDRO	
• Inverter Skids	

1.5.1. Opportunities Outside the Roadmap

Market engagement[19] identified two potential opportunities for Government to further diversify decarbonisation options that may fall outside of the scope of the Roadmap. Private industry is driving market outcomes in the areas of Green Hydrogen and Offshore Wind at pace - with either no reliance on regulated transmission networks or strategies that involve lower risk use of the existing energy network infrastructure.

Both Green Hydrogen and Offshore Wind are large scale opportunities that utilise an equivalent supply chain to that considered by the Roadmap. Government can avoid negative outcomes such as capacity constraints or cost increases with consultation and collaboration with developers in both emerging technologies. A coordinated approach can identify and realise complementary opportunities to drive greater local content through economies of scale and sharing of resources.

[18] MBB note that wind towers are currently manufactured in Victoria however market engagement participants were concerned about the capacity to meet future demand

[19] Found at **Appendix 5**

1.5.2. Cost Constraints

To demonstrate that interventions are in the best interests of electricity consumers, Government should consider market feedback on the potential cost impacts of local content requirements. The key points raised were:

- Labour costs are higher in Australia which means manufacturing is typically not competitive unless there is a high level of automation
- Electricity costs are higher in Australia which means manufacturing is less competitive
- Developer decisions to use offshore suppliers are mostly based on cost as many projects are marginal and so cost increases could make a project unviable
- Quality assurance, WHS standards, lower maintenance costs and being able to quickly make changes if something goes wrong were reasons why local manufacturers could sustain higher prices. Developers / contractors indicated that ~10% higher prices could be justified, but over that there would be no alternative to sourcing internationally

1.6. Recommendations[20]

MBB recommend a range of activities to ensure the Roadmap is delivered efficiently, attract investment, give project certainty, achieve sustainable job creation and develop potential centres of excellence in NSW.

Table 3: Summary Recommendations

DESCRIPTION	PREFERRED OUTCOME / ACTIONS
1. Facilitate a Sustainable Rollout of the Roadmap	
Measures should be taken to ensure that the investment to deliver the Roadmap is undertaken in a manner to allow a sustainable market to develop. This would reduce the risk of excessive cost escalation as well as encouraging long term development of the workforce and supply chain through training and local manufacturing.	As discussed in Section 6.7, the key outcomes would be: • A smooth investment profile, limiting peaks and troughs • Investment ramp up over ~2 years and is spread over time so that local industry can prepare • Annual investment of $4 billion to $5 billion (equivalent to 2 to 3 GW of capacity per year) appears sustainable • Investment in transmission should commence as early as possible - this is key to commencing all other investment

[20] Found at Section 8

DESCRIPTION	PREFERRED OUTCOME / ACTIONS
There is an opportunity for the State to take a lead role in the development of the rules and processes related to generator connection / registration and network development. This would require the NSW Government to collaborate with the AEMC and AEMO to create a faster and more efficient process.	• Collaboration would need to unpack any current or future regulatory initiatives and explore ways to streamline or modify 'usual' practice. • Modelling of network capacity and amount of generation that can be connected within each REZ needs to be undertaken well in advance of generator applications being received. • Investigate opportunities to develop a contestable market for transmission development. Government would need to analyse regulatory and legal pathways, as well as engage with the market to understand their level of interest and any commercial concerns.
2. Provide Certainty to the Market	
DPIE should regularly engage with market to demonstrate the State's commitment to the Roadmap and ensure the supply chain can prepare for the scale of upcoming investment.	• Roadshows, workshops and announcements should be developed to provide specific information including government initiatives, project locations, development value, timing of construction start and commissioning, and risk profiles. • Development of a pipeline within given uncertainty tolerances will provide the market with the opportunity to plan, invest and to be ready for the growth opportunities. • The provision of greater certainty reduces the risk of constraints in the supply chain and increases confidence for the development of industry initiatives involving training, skills, local content and jobs creation.
3. Identify and Attract New Entrants	
DPIE should proactively identify potential new entrants to the market (both local or international) and approach them to discuss challenges and opportunities of investing in the Roadmap.	• Identification of potential new entrants (across all components of the supply chain) • Engagement with new entrants to understand challenges and opportunities as well as discuss timelines for investment and identify specific actions DPIE can take to facilitate market entry. • DPIE should also consider the value of an international roadshow, focused on key international markets.
4. Maximise Local Content	

DESCRIPTION	PREFERRED OUTCOME / ACTIONS

DPIE should develop a strategy to maximise local content in Roadmap projects	• Set local content requirements in tenders for transmission construction and in reverse auctions for generation / storage connections / registration. These need to be supported by detailed research into current local capacity and feasible increases in capacity
	• Ensuring reporting and audit systems are in place during and post construction to ensure compliance with local content commitments.
	• Enforcing requirements for tenders to ensure a level playing field for local suppliers, for example:
	  o Modern slavery
	  o Quality certification
	  o Environmental requirements
	  o WHS requirements / accreditations throughout the supply chain

DPIE should engage with industry to facilitate expansion of local capability	• Engage with international manufacturers about collaborating with local manufacturing facilities or establishing local assembly plants that could service NSW or the whole of Australia. Care needs to be taken to ensure that material value add is undertaken locally rather than 'token' assembly of overseas components, noting that for complex machinery such as High Voltage network equipment, there is an interlinked worldwide supply chain which cannot be entirely replicated within Australia • Facilitation of loans to fund expansion of facilities, identification of skills gaps • Facilitating discussions between developers and local manufacturers to ensure there is a full understanding of local capabilities and manufacturers have an opportunity to develop new designs using advanced manufacturing techniques that compete with imported products
Government should consider supporting a local manufacturing pilot to increase capabilities and increase cooperation within the industry	• For example, BlueScope has offered space in its' Port Kembla facility for steel fabricators to set up facilities to manufacture components for renewable energy construction.
Putting in place incentives / frameworks to encourage material recycling industries to develop that can recover and recycle the key materials from	• Reduce the need for additional mines to source new material as well as reducing the environmental impact of the infrastructure. • The new recycling industry will create additional jobs within NSW that may otherwise be created interstate or overseas

DESCRIPTION	PREFERRED OUTCOME / ACTIONS
life-expired facilities or equipment.	
5. Ensuring Timely Approvals	
Agencies will need to increase capacity to avoid unnecessary delays to developers	• The preferred outcome is for planning and environmental approvals, grid connections and registrations to be provided within a reasonable timeframe • DPIE, AEMO and TransGrid should examine the pipeline developed by DPIE and determine the level of internal resources needed to undertake the various approval processes
6. Engage with the broader renewable energy community (participants and their projects)	
Engagement with developers in similar industries outside the Roadmap (offshore wind and green hydrogen) should be undertaken to better understand competing projects.	• DPIE to engage with developers in these industries to understand their plans and potential overlaps in requirements • Where there are similar skills / supply chains required, act in a coordination role to ensure that the supply chains are utilised efficiently and are aware of future demand • Investigate collaboration in industry building initiatives such as joint training facilities
7. Lead a Coordinated Approach	
DPIE should consider the development of a centralised digital network or 'one-stop shop' for the Roadmap supply chain to provide participants with information about the program. This would assist industry in identifying and implementing initiatives to increase local content.	The centralised digital network could include: • Register of suppliers • Register of jobseekers / apprenticeship pool • Training portal • Job portal • Timeline of projects in pipeline • Tender platform • Capability and capacity network • Upcoming Renewable Energy Sector events / roadshows • Announcements
DPIE should consider the coordination of road upgrades across regions, including potentially collecting	For each REZ, DPIE should: • Engage with developers and contractors to understand requirements for transport of equipment / materials into the region

DESCRIPTION	PREFERRED OUTCOME / ACTIONS
contributions from developers to help fund road upgrades.	• Identify where there are parts of the transport network that act as limiting factors (for example bridges requiring strengthening / temporary bypasses of towns for oversize items) • Coordinate a response with developers / contractors / local councils
Work with industry to identify skills gaps and consider supporting appropriate training programs through TAFE for example, to fill these gaps.	• Undertake studies to identify key areas where there are skills gaps or potential for a larger workforce to be trained. • Identify training courses that could be implemented and the location (for example in key regional centres located near each REZ) • Identify the party best placed to deliver the course (for example, TAFE, private Registered Training Organisations or new 'centres of excellence') • Identify whether there are any specific facility requirements for the courses (for example towers / electrical installations to teach specific skills that would be required on renewable energy projects)

1.7. Conclusion[21]

The Roadmap presents a significant opportunity for NSW Government to develop the local renewable energy supply chain. With total investment of up to $32 billion[22] by 2030, many segments of the local supply chain can potentially reach the scale necessary to compete with international suppliers.

However, significant coordination and investment is required to achieve this goal, with Government well placed to undertake some of these activities.

The next steps are for Government to review the potential interventions identified in this report and develop business cases to identify those that would make a positive impact to the state. This should be done expeditiously, as investment in the Roadmap is expected to ramp up quickly and many interventions (such as training courses) take a significant amount of time to set up and deliver.

[21] Found at Section 9

[22] https://www.energy.nsw.gov.au/government-and-regulation/electricity-infrastructure-roadmap

2 Introduction

2.1. Background

The NSW Government's *Electricity Infrastructure Roadmap* November 2020 (Roadmap) is a coordinated framework to deliver a sustainable and flexible electricity system for NSW. The Roadmap continues the NSW Government's commitment to developing Renewable Energy Zones (REZ), through the establishment of a Transmission Development Scheme (Scheme). The Scheme and the REZs will also be supported by an Electricity Infrastructure Investment Safeguard, providing support for private investment in new generation, long duration storage and firming projects, including pumped hydro energy storage.

This coordinated approach to transmission, generation, storage and firming will deliver approximately 12 gigawatts of equivalent renewable generation capacity through the Central-West Orana (CWO), New England and Southwest REZs by 2030, with additional REZs announced for the Hunter and Illawarra regions.

The Roadmap will attract up to $32 billion in private investment in regional energy infrastructure investment by 2030 and support over 6,300 construction and 2,800 ongoing jobs in 2030, mostly in regional NSW.

The NSW Department of Planning, Industry and Environment (DPIE) wishes to understand the developer and contractor supply markets that would participate in the Roadmap and REZs to identify issues and propose solutions that support the private sector's delivery of infrastructure under the Roadmap over the next 10 years.

MBB Group has been appointed by DPIE to assist with understanding these issues and provide solution pathways, including the development of this report.

2.2. Objectives

This report seeks to identify the pipeline of major electricity projects in NSW over the next 10 years and major competing infrastructure projects across Australia (primarily within the transport sector). These pipelines are then used in identifying potential market constraints and dependencies in delivering the desired program of electricity infrastructure projects, whilst also prioritising opportunities to stage the implementation of the Roadmap to achieve best value for money outcomes.

A key consideration will be to identify when suppliers and/or communities could present a delivery constraint in the next 10 years and recommend ways to achieve the Roadmap objectives in a sustainable way.

This report also seeks to identify opportunities for local industry and labour in the renewable energy supply chain and mechanisms that DPIE can employ to maximise local participation in the supply chain for the Roadmap investments. This analysis is informed by market engagement with representative participants from the supply chain.

2.3. Report Sections

2. INTRODUCTION	Provides background to MBB's engagement to develop this report
3. MAJOR ELECTRICITY PROJECT PIPELINE	The pipeline of proposed infrastructure developments in the electricity sector over the next 10 years based on the Roadmap, publicly available information and information made available by DPIE
4. INFRASTRUCTURE PIPELINE	The pipeline of proposed major infrastructure developments within Australia over the next 10 years based on publicly available information
5. RESEARCH UNDERTAKEN	An overview of the research undertaken to inform potential market constraints, opportunities and recommendations
6. POTENTIAL MARKET CONSTRAINTS	Based on the forecast pipelines of infrastructure developments and a current understanding of the contractor / supplier markets in NSW, this section sets out development constraints, potential interventions and scenarios to optimise the delivery timeframes of the Roadmap to maximise value for money
7. SUPPLY CHAIN OPPORTUNITIES	Identification of opportunities for local participation in the supply chain and current issues that prevent greater local supply chain participation
8. RECOMMENDATIONS	Recommendations on interventions that DPIE and other market participants can implement to increase local participation in a cost-effective manner
9. CONCLUSIONS	Summary of the opportunities in the renewable energy supply chain and next steps

3 Electricity Infrastructure Project Pipeline

3.1. Introduction

Under the Roadmap, approximately 12 gigawatts of equivalent renewable generation capacity will be delivered through the Central-West Orana, New England and Southwest REZs by 2030. This will attract up to $32 billion in private investment in regional electricity infrastructure by 2030 and support over 6,300 construction and 2,800 ongoing jobs in 2030, mostly in regional NSW. In addition to the Roadmap, NSW Government has announced additional REZs for the Hunter and Illawarra regions[23].

MBB has undertaken an analysis of the potential spending levels over the next 10 years to understand the impacts these investments are likely to have on the infrastructure supply chain.

3.2. Methodology

A model has been developed in Microsoft Excel that forecasts the potential construction spend each year from 2021 to 2030. The model is flexible to allow changes in timing of investments in the electricity network and the size of each investment being undertaken.

Following the development of an initial version of the model using MBB sourced assumptions, the inputs and calculations were workshopped with DPIE (Data and Analytics Team, Consumer Trustee and REZ Team) to ensure alignment with current thinking around the planned rollout of the Roadmap.

MBB notes that changes in the assumptions, particularly around timing of rollout of REZs and cost information may have a significant impact on the forecasts generated for annual spend. Recommendations that are based on these forecasts may not be valid if the underlying assumptions are changed.

3.2.1. Information Sources

MBB has used the following information sources to develop assumptions underlying the pipeline forecast:

- AEMO Integrated System Plan
- NSW Electricity Infrastructure Roadmap
- NSW Government REZ website
- NSW Renewable Energy Project Pipeline (March 2021)
- CSIRO GenCost 2020-21 Consultation Draft

[23] At the date of this report, no details on the size or timing of these REZs have been released to the public.

- Assumptions made by MBB and DPIE based on industry / policy knowledge

3.2.2. Assumptions

The key assumptions used within the analysis are set out in the following tables.

3.2.2.1. REZ Zones

Table 4: General REZ Zone Assumptions

ASSUMPTION	VALUE	SOURCE
TOTAL GENERATION CAPACITY INITIAL REZ	12 gigawatts	DPIE
TOTAL NEW STORAGE INITIAL REZ	2 gigawatts	DPIE

Table 5: Individual REZ Assumptions

ASSUMPTION	CWO	NEW ENGLAND	SOUTHWEST	HUNTER	ILLAWARRA
GENERATION CONSTRUCTED (MEGAWATTS)	3,000[3]	8,000[3]	3,000[4]	3,000[4]	3,000[4]
LENGTH OF TRANSMISSION NETWORK INVESTMENT REQUIRED (KILOMETRES)[2]	180	150	250	100	100
TRANSMISSION INVESTMENT COST ($ MILLION)	650[5]	1,345[5]	872[1]	349[1]	349[1]
CONSTRUCTION START	2023[3]	2025[4]	2027[4]	2030[4]	2032[4]
CONSTRUCTION COMPLETE[4]	2024	2027	2028	2031	2033

Notes:
1 Pro-rata based on megawatts and kilometres
2 Based on high level map of proposed REZs. Hunter and Illawarra have existing transmission infrastructure and so estimated lengths have been reduced
3 DPIE
4 MBB assumption
5 AEMO ISP

3.2.2.2. Storage

Storage is assumed to be constructed independent of the REZs. Roadmap data from DPIE was used as the basis for annual investment in each type of storage (pumped hydro / battery).

Table 6: Incremental Storage Investment Assumptions

STORAGE TYPE	2023/4	2024/5	2025/6	2026/7	2027/8	2028/9	2029/30	2030/1
PUMPED HYDRO (MEGAWATTS)	0	0	0	660	1,110	270	0	0
BATTERY (MEGAWATT HOURS)	63	38	25	38	25	38	25	38

3.2.2.3. Other ISP Projects

Table 7: Investment in Other ISP Projects[24]

ISP PROJECT	VALUE ($ MILLION)	CONSTRUCTION START	CONSTRUCTION END
VNI MINOR	105	2022	2023
ENERGYCONNECT	1,990	2022	2024
HUMELINK	2,100	2023	2026
VNI WEST	1,730	2026	2028
QNI MEDIUM	2,115	Assumed not proceeding within analysis timeframe due to impact of REZ investments[25]	

[24] AEMO Integrated System Plan 2020

[25] Based on input from DPIE

3.2.2.4. Generation / Storage Investment

Table 8: Timing of Private Investment (generation / storage / firming)

ASSUMPTION	VALUE	SOURCE
TIMING OF START OF GENERATION CONSTRUCTION ROLLOUT	1 year prior to end of relevant REZ construction	MBB
ROLLOUT PERIOD	• CWO: 2 years • New England: 3 years • Southwest: 5 years • Hunter: 3 years • Illawarra: 3 years Construction of an equal amount of capacity is assumed to start in each of the years	Rollout periods set to produce a consistent spend profile

Table 9: Investment Assumptions for generation / storage investment

PIPELINE CATEGORY	CONSTRUCTION PERIOD (YEARS)[4]	AVERAGE COST ($M / MW)[1]	ANNUAL COST REDUCTION[3]	PROPORTION OF GENERATION TYPE[2]
GENERATION				
SOLAR PV	1	1.40	4.8%	CWO: 48% New England: 66% Southwest: 98% Hunter: 40% Illawarra: 42%
WIND	2	1.90	0.3%	CWO: 52% New England: 34% Hunter: 60% Illawarra: 50%
COGEN	3	3.33	0%	Illawarra: 8%
BIO-GAS	3	3.90	0%	Southwest: 2%
STORAGE / FIRMING				
BATTERY STORAGE	1	0.30 (per MWh)	7.4%	N/A
PUMPED HYDRO	3	2.65	0.2%	N/A

Notes: 1 Calculated from CSIRO GenCost 2020-21 Consultation Draft (Solar / Wind / Battery / Pumped Hydro), Calculated average from NSW Renewable Energy Project Pipeline (March 2021) (Remainder)
2 Calculated from NSW Renewable Energy Project Pipeline (March 2021)
3 Calculated from CSIRO GenCost 2020-21 Consultation Draft
4 MBB Assumption

3.2.3. Calculations

The major calculations are as follows:

- Construction periods for each investment type are calculated for each REZ and AEMO Integrated System Plan (ISP) project based on timing assumptions
- The amount of generation / storage commencing construction each year is calculated (split by type of generation / storage and by REZ)
- The annual costs for REZ infrastructure are calculated based on assumed total cost of infrastructure and the construction period
- The annual costs for ISP projects are calculated based on ISP estimate of total cost and the length of construction
- The annual costs for generation / storage investment already in construction is calculated based on NSW Renewable Energy Project Pipeline (March 2021), which sets out the anticipated construction costs and construction periods
- The annual costs for investment in generation is calculated based on average cost per MW for each type of generation
- The annual costs for investment in storage / firming is calculated based on average cost per MW for each type of storage / firming

The results are then aggregated and then summarised in output charts.

3.2.4. Scenarios

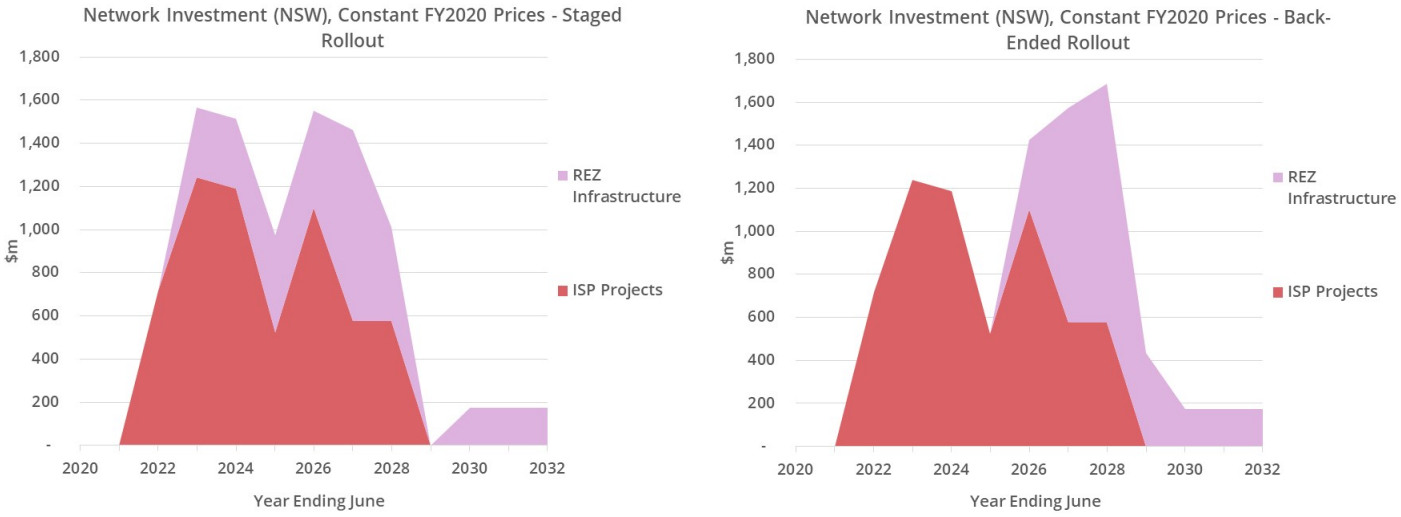
Two scenarios have been examined:

1. Staged Rollout: Under this scenario, the timing of development of each REZ and the associated generation / storage investment is managed to produce an even spend profile to 2030, and assumptions are as outlined in Section 3.2.2
2. Back-Ended Rollout: This scenario is intended to reflect the likely AEMO recommendation that from a network perspective, most of the generation / storage investment is not required until close to 2030. Under this scenario, CWO REZ infrastructure is built in 2026/2027, with generation built over 2 years. New England REZ infrastructure is built in 2027/2028, with generation built over 2 years. Southwest REZ Infrastructure is built in 2028/2029 with generation built over 3 years.

3.3. Network

There is a consistent program of investment in the transmission network until 2029, as shown in Figure 4. This is supported by ISP projects as well as the investment in REZ infrastructure. In both scenarios, the pipeline of work is relatively even, albeit at historically high levels. The labour upskilling programs implemented for EnergyConnect will help to ensure that a skilled workforce is available for future projects.

Figure 4: Network Investment (NSW), Constant FY20 Prices



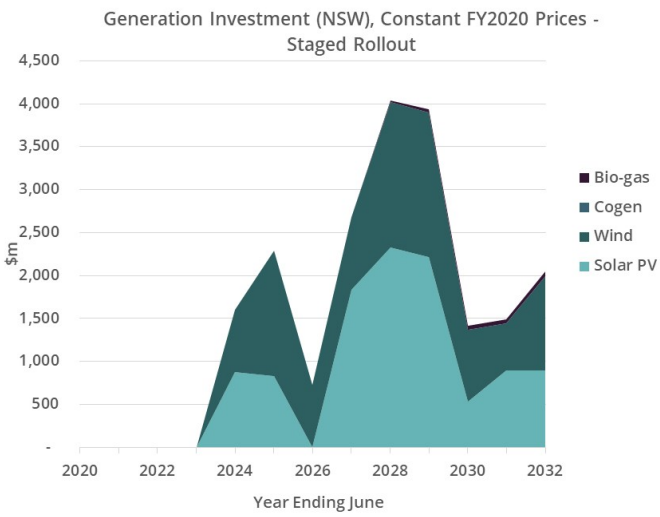
3.4. Generation

Construction of generation follows the development of infrastructure in each REZ - this can be seen in the peaks in the Staged Rollout for CWO in 2025 and New England in 2028/2029 shown in Figure 5. Under the Staged Rollout, construction capacity is built up over time, from $2 billion per year in 2024/2025 to $4 billion per year in 2028/2029.

Under the Back-Ended rollout all construction is undertaken in a short period, leading to a single peak in construction of $6 billion in 2028/2029 and a quick decline back to $2 billion per year. This would not be efficient for industry to deliver as it would be unviable to train the workforce for 2 years of construction and be underutilised thereafter.

Investment is equally split between wind and solar generation, with minor investments in co-generation and bio-gas.

Figure 5: Generation Investment (NSW), Constant FY20 Prices



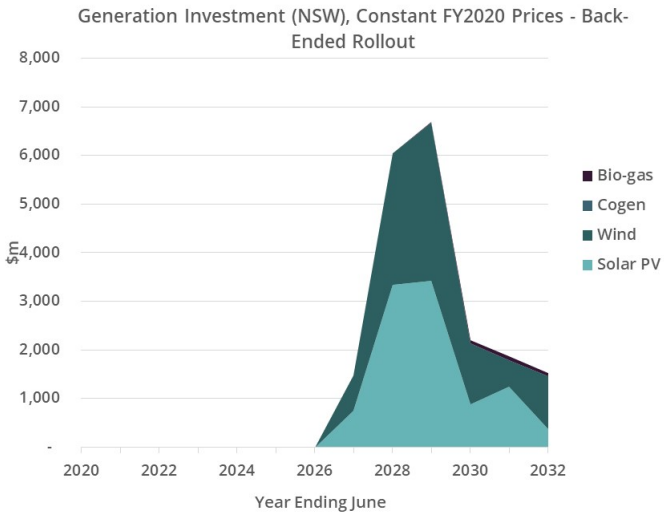
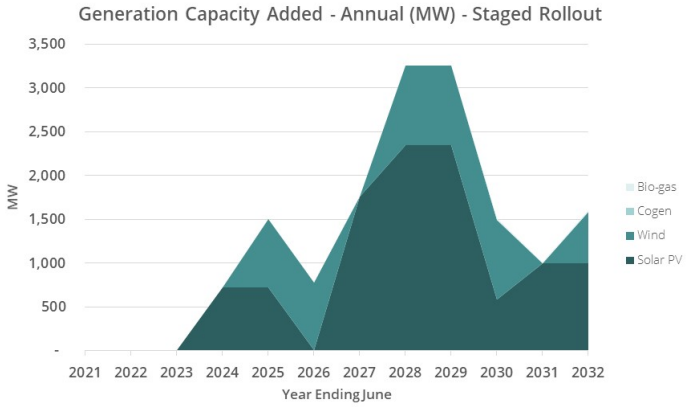
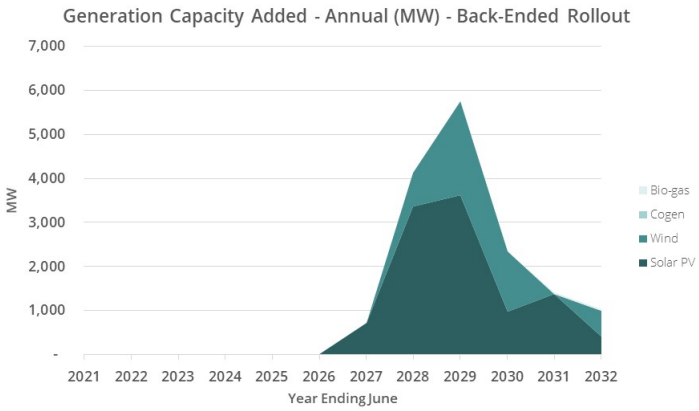


Figure 6: Annual Generation Capacity Added



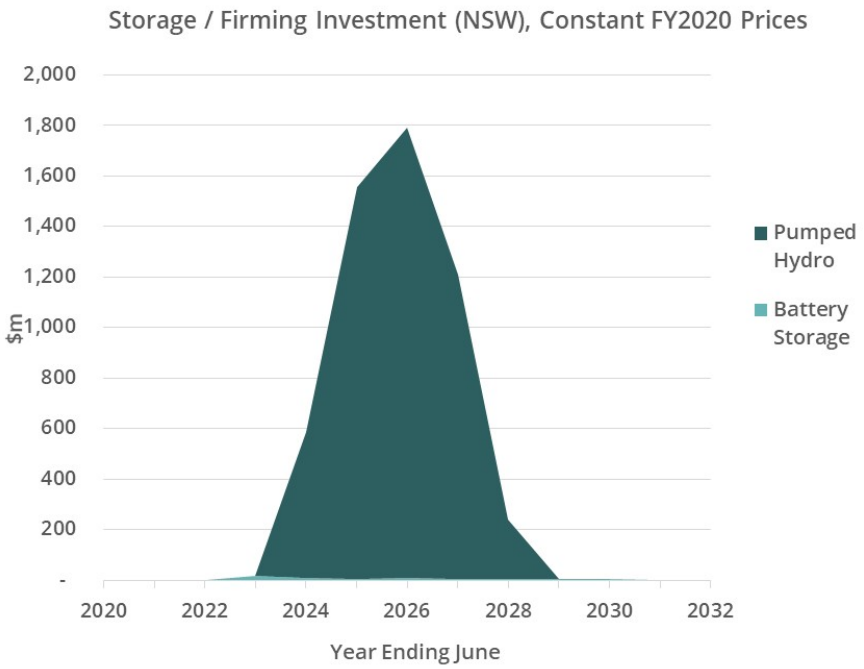


3.5. Storage / Firming

Under the Roadmap Data assumptions, storage / firming investment is dominated by a small number of large pumped hydro projects. Out of a total 2.27GW of capacity, 2.04GW is forecast to be pumped hydro. On a 'per MW' basis, pumped hydro is significantly more expensive than battery storage, which leads to the investment amounts for pumped hydro representing an even greater proportion of total costs.

Due to the large costs for individual pumped hydro projects, the spend profile has a large peak, which may lead to labour supply issues in the relevant regions.

Figure 7: Generation Investment (NSW), Constant FY2020 Prices



3.6. Overall Pipeline

An aggregate of the overall pipeline of major electricity projects under the Staged Rollout scenario is shown in Figure 8. Over the period from 2021 to 2030 there is a very significant volume of investment in the sector, both on an annual basis and in total. In particular, the period from 2024 to 2029 averages nearly $5 billion per year, which is significantly higher than the industry is currently delivering ($1 billion to $1.5 billion) and suggests that interventions may be required to prepare industry for this peak.

Under the Back-Ended Rollout in Figure 9, investment is compressed into a much shorter period, with a sharp peak in 2028 / 2029 of over $7 billion per year, as opposed to a more gradual increase in required capacity and a lower peak in the Staged Rollout.

The 'Historical / Current Projects' component represents renewable energy projects that have either been completed or have already commenced construction. This data was provided by DPIE and includes the construction of Snowy Hydro 2.0.

Figure 8: Major Electricity Projects (NSW), Constant FY2020 Prices – Staged Rollout

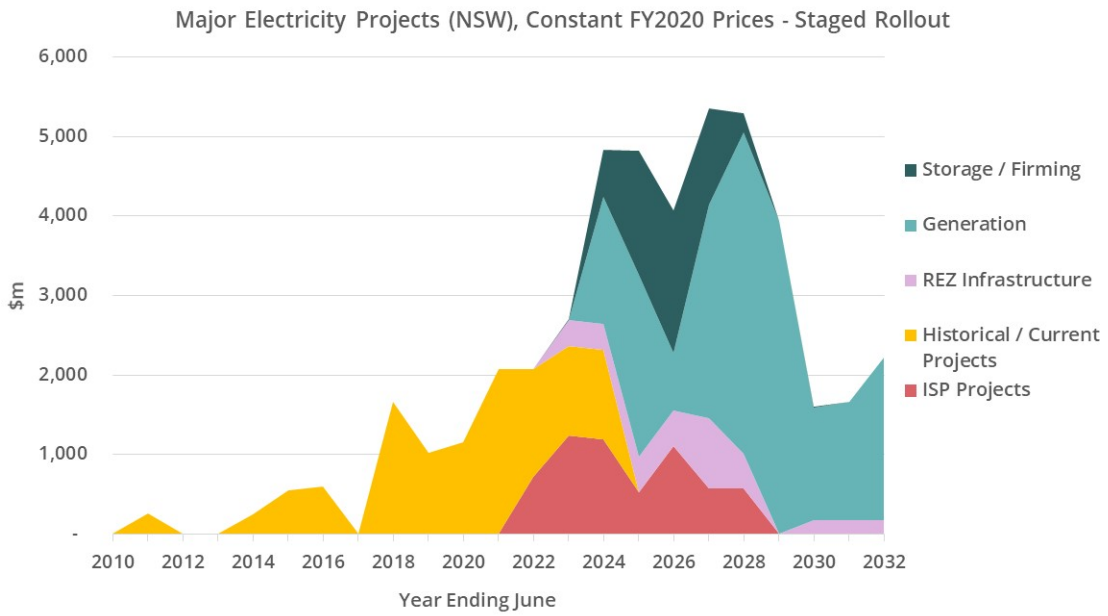
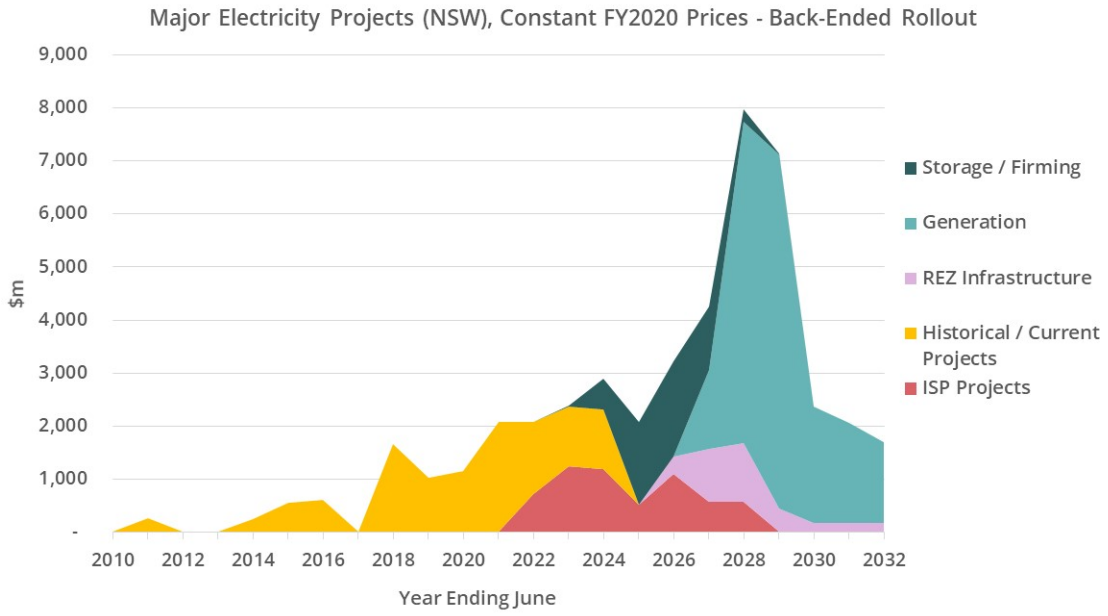


Figure 9: Major Electricity Projects (NSW), Constant FY2020 Prices – Back-Ended Rollout



3.7. Spending Profile by Cost Category

As part of the supply chain analysis in Section 5 and illustrated in **Appendix 1**, a breakdown of project costs was identified for each type of infrastructure investment. This was applied to the electricity market investment profiles set out above to generate a forecast of spending by cost category each year. A further breakdown of cost categories is detailed in **Appendix 2**.

Figure 10 shows the spending profile for the Staged Rollout and Figure 11 shows the spending profile for the Back-Ended Rollout. These provide an indication of the relative size of the opportunities in each sector.

Figure 10: Spend Profile by Cost Category (NSW), Constant FY2020 Prices – Staged Rollout

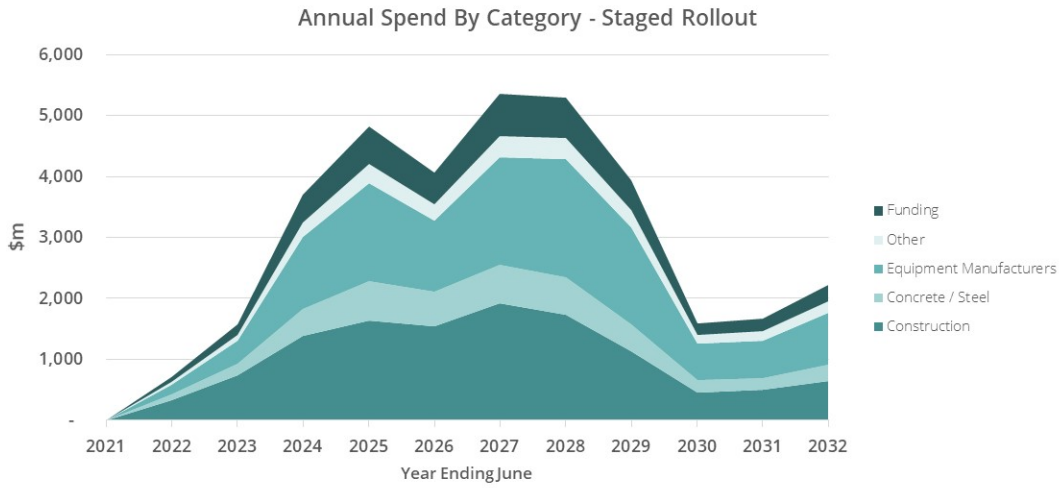
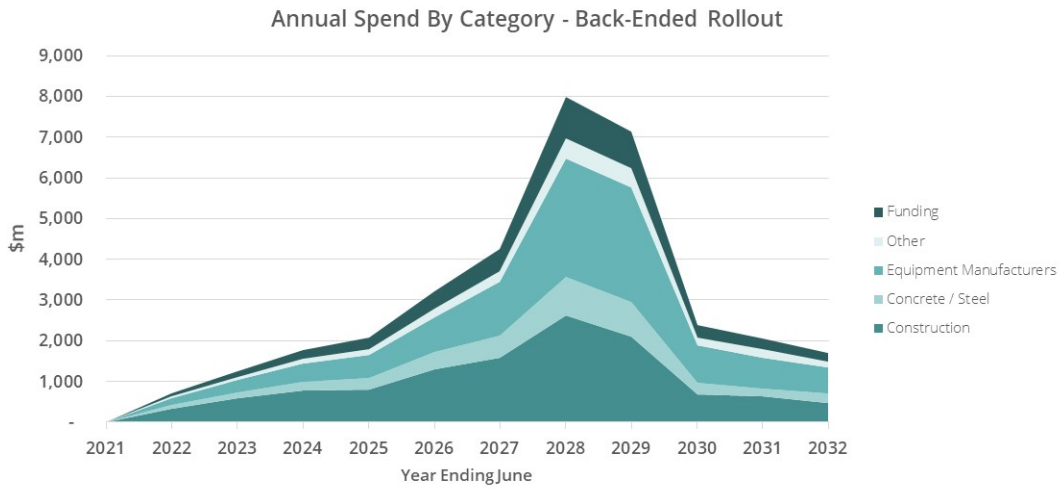


Figure 11: Spend Profile by Cost Category (NSW), Constant FY2020 Prices – Back-Ended Rollout



4 Infrastructure Pipeline

4.1. Introduction

Many of the contractors that undertake infrastructure construction are also involved in delivering other major civil works across the transport, water and mining sectors[26]. Where these other sectors also have capacity constraints, there will be flow-on impacts on delivery of electricity infrastructure, especially where there are common skills used such as civil engineering construction because the workforce will be spread across all these sectors[27].

This section of the report sets out the investment pipeline for the transport sector, being the largest civil construction sector competing with the electricity infrastructure pipeline.

4.2. Methodology

4.2.1. Information Sources

MBB has used the following sources to develop underlying assumptions of project values and timings for the pipeline forecast:

- BIS Oxford Economics
- Infrastructure Partnerships Australia - Australia & New Zealand Infrastructure Pipeline
- Infrastructure Australia – Infrastructure Priority List

4.2.2. Assumptions

The key assumptions used in the analysis are:

- Construction costs are spread equally across the construction period
- Where construction cost or timing was not publicly available, an estimate was made based on the best available information

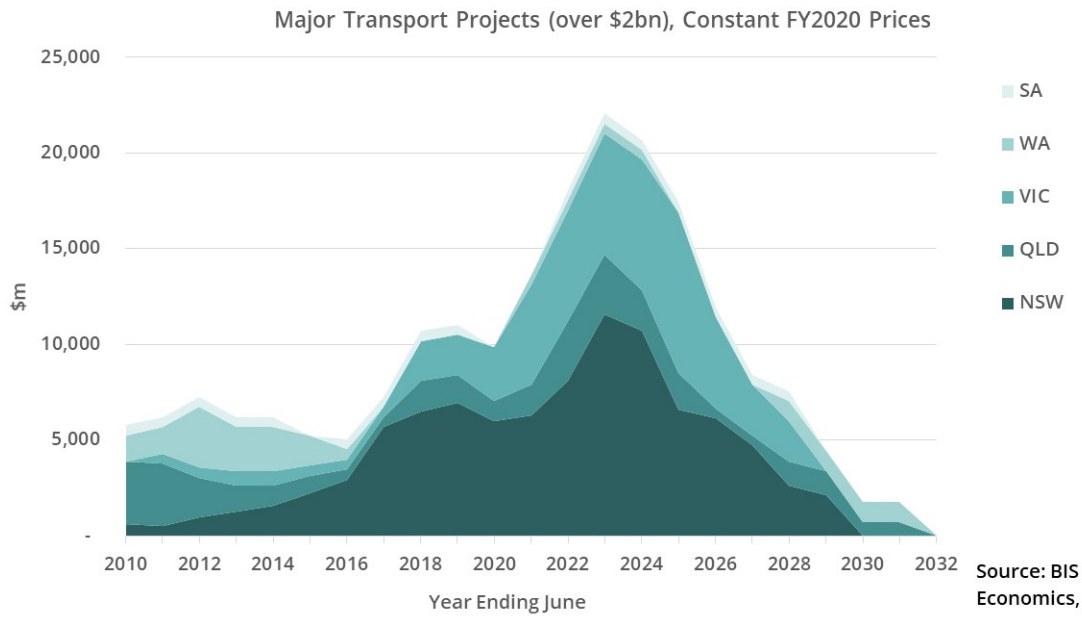
4.3. Infrastructure Pipeline

Based on the information and assumptions set out in Sections 4.2.1 and 4.2.2, MBB developed a forecast of annual spend on transport projects. This is set out in Figure 12.

[26] For example, CPB, UGL, Downer, Clough, Acciona

[27] For example, earthworks, foundations, erection of settle structures, concreting, crane operation

Figure 12: Transport Spend Profile by State, Constant FY2020 Prices



Source: BIS Oxford Economics, MBB Analysis

The forecast in Figure 12 shows that over the next 5 years there is a large peak in committed investment in transport projects across Australia, led by NSW and Victoria (currently $6 billion per year and reaching $11 billion in 2023 in NSW). Transport civil construction is a mature industry that has been delivering a large volume of major projects within NSW and Australia for the last 5 years. Even so, there has been a strong focus on capacity building within the workforce and elements of the supply chain to ensure that there will be capacity to deliver the peak construction over the next 5 years. Examples of the initiatives that have been introduced are set out in **Appendix 3** and include minimum ratios of apprentices and other 'learning workers' as well as development of partnerships with Vocational Education and Training providers such as TAFEs.

The drop off in committed investment from 2026 onwards shown in Figure 12 is driven by the state budget cycles, where projects are only committed within the budget forecast period. It is expected that further investment will be announced in future budgets that will show a continued high level of investment. This means that it is likely that to deliver the Roadmap, additional workforce will need to be trained with appropriate skills, as the existing civil workforce will continue to be required to deliver the transport investment program.

5 Research Undertaken

To inform the identification of potential market constraints, opportunities and recommendations, MBB has conducted research of public information and undertaken the investigation activities outlined in this Section 5.

5.1. Market Engagement

A market engagement process was undertaken to consult with a cross section of the electricity infrastructure industry to identify constraints, risks and opportunities faced by the supplier market in the rollout of the Roadmap.

The feedback requested from the supplier market was designed to enable NSW Government to:

- Understand the supply chain constraints, risks and opportunities to deliver the Roadmap
- Identify opportunities for increased local participation in the Roadmap
- Understand potential cost implications of increased local content
- Support the Consumer Trustee to schedule the rollout of the Roadmap to reflect industry's delivery capability
- Support the Infrastructure Planner develop a coordinated and centralised approach.

The list of organisations interviewed[28] is shown in Table 10.

Table 10 - Interview List

INTERVIEW	ORGANISATION	CATEGORY DESCRIPTION
1	Australian Steel Institute	Steel Industry Peak Body
2	BlueScope	Manufacturer – Flat Steel Products
3	Canadian Solar	Developer – Solar PV
4	Clean Energy Council	Renewable Energy Industry Peak Body
5	Clough	EPC Contractor
6	CPB Contractors	EPC Contractor

[28] One participant, GE submitted a written response.

INTERVIEW	ORGANISATION	CATEGORY DESCRIPTION
7	Elecnor	EPC Contractor
8	Fluence	Manufacturer – Battery Components
9	Fortescue Future Industries	Developer – Hydrogen Generation
10	GE	Manufacturer – Pumped Hydro
11	Neoen	Developer – Solar PV / Wind / Battery
12	Nexans Olex	Manufacturer – Cable
13	Origin Energy	Developer – Battery / Pumped Hydro
14	Oven Mountain Pumped Hydro	Developer – Pumped Hydro
15	Precision Oxycut	Manufacturer – Steel Fabricator
16	Tesla	Manufacturer – Battery
17	TransGrid	Developer – Transmission
18	Vestas	Developer – Wind
19	Wilson Transformer Company	Manufacturer – Transformers

Details of the market engagement process, questionnaire and key findings are set out in **Appendix 5**.

5.2. Case Studies

Using publicly available sources, MBB researched recent comparable case studies across both international and domestic jurisdictions. The Case Study Report found at **Appendix 4** summarises key findings and recommendations to sustainably achieve the Roadmap objectives.

The case studies seek to identify projects and jurisdictions with similar challenges and objectives to NSW and the Roadmap. The Case Study Report aims to distil key lessons to support the Renewable Energy Sector Board in identifying job creation and local manufacturing opportunities in the rollout of the Roadmap.

The case studies that have been developed are:

- BHP Local Buying Program
- Denmark: Local Value Creation
- Government of Ontario Canada Long Term Infrastructure Plan

- IRENA Leveraging Local Capacity – Renewable Energy: Onshore Wind
- OECD Developing Robust Project Pipelines for Low-Carbon Infrastructure
- Snowy Hydro 2.0 Polo Flats Concrete Segment Factory
- Victorian Government Local Steel Pledge
- Bankwest Stadium Local Steel
- ACT Government Renewable Energy Program

Details of the case studies and the relevant findings are set out in **Appendix 4**.

5.3. Supply Chain Diagrams

Based on the market engagement, case studies and desktop research by MBB, the supply chain for each of the major renewable energy sectors (Battery / Pumped Hydro / Solar PV Generation / Transmission / Wind Generation) is shown diagrammatically in **Appendix 1**, with details on:

- Estimates of current levels of local content
- Capacity to deliver the Roadmap
- Proportion of total cost represented by each component of the supply chain
- Examples of companies active in each component of the supply chain

6 Potential Market Constraints

Based on MBB's knowledge of major infrastructure markets, outcomes from the market engagement found at **Appendix 5** and the case Study report at **Appendix 4**, constraints faced by each market segment have been set out in this Section 6 along with potential interventions and opportunities. This is followed by an analysis of the potential development pathway for the Roadmap.

6.1. Developers

Developers are the entities that drive private sector investment in NSW's electricity infrastructure. They coordinate the other participants in the supply chain and take ultimate responsibility for the success of a project. In the renewable energy sector, developers range from large multinational investment companies undertaking multiple investments simultaneously through to individuals focused on a single project.

Generation / Storage / Firming

The recent expression of interest for the CWO REZ has shown there are a significant number of developers in the market waiting for favourable investment conditions, with the total capacity of the proposed REZ covered nine times over by responses[29]. This would indicate that capacity issues within the developer market are unlikely to be a limiting factor for delivery of the Roadmap.

Market engagement feedback indicated that risk allocation is a key consideration for developers, particularly the ability and cost to connect to the electricity grid and obtain registration. Developers interviewed indicated that connection and registration risk is the driving factor behind their decision to invest in the Roadmap.

Transmission

Currently TransGrid as the Transmission Network Service Provider (TNSP), is the dominant developer of transmission infrastructure in NSW. It should be noted however, that other parties have proposed developing individual projects outside the regulated transmission space.

TransGrid recently completed procurement of EnergyConnect, the 700 km interconnector between the grids of NSW, Victoria and South Australia. It is recommended that DPIE make its own investigations and determine a level of certainty that TransGrid can deliver multiple such projects simultaneously[30], as under the current regulatory regime, TransGrid may be reluctant to invest if it cannot recover development costs to the satisfaction of its security holders.

[29] https://energy.nsw.gov.au/renewables/renewable-energy-zones#-centralwest-orana-renewable-energy-zone-pilot-

[30] Within the period to 2030, TransGrid would need to deliver HumeLink, VNI West as well as the REZ infrastructure

Table 11: Developer Interventions and Opportunities

DESCRIPTION	SOURCE
Interventions	
Ensure attractive risk allocation, for example by providing a structured approach to allocating grid connection and generator registration that provides greater certainty of connection and reduced time for assessment[31].	• Market Engagement
Marketing the Roadmap program to industry to ensure that it is aware of the upcoming pipeline so that they can scale up with confidence. Other sectors have undertaken local and international roadshows with commitments to future investment made as firm as possible to promote confidence	• MBB Analysis • TfNSW has used this strategy for its investment program
Agreeing development costs up front with TNSPs to provide certainty that they will be paid for development work, allowing transmission investment to progress	• MBB Analysis & experience on Project EnergyConnect
Opportunities	
Explore opportunities to develop a contestable market for transmission development. This would bring in additional capacity and capabilities to the sector, potentially facilitating rollout at a faster rate. Government would need to analyse regulatory and legal pathways, as well as engage with the market to understand their level of interest and any commercial concerns	• MBB Analysis

6.2. Contractors

Contractors deliver the physical works on site utilising a supply chain of their own resources or through subcontractors and suppliers. The contractor assumes overall responsibility for construction including local content compliance, while subcontractors may deliver discrete packages / services under the management of the Contractor.

[31] MBB understand a separate workstream is examining key risks and investment considerations that are constraining market capacity to deliver.

Constraints for contractors typically fall into two areas:

1. Workforce: the ability to source an appropriately skilled workforce to manage and undertake the works. This can be from: existing labour resources in the region, an existing workforce transferred from other regions, training new local workforce, or bringing in an experienced fly-in-fly-out (FIFO) workforce from overseas. The proportions of each will depend on timing and location of each project, and the contractor's determination of the likelihood of future projects to justify investment in new labour.
2. Financial capacity: on many large, complex projects such as renewable energy or transmission, the contractor is required to guarantee delivery on a 'fixed time, fixed cost' basis. This involves provision of financial guarantees that are supported by the company's balance sheet. As such, each contractor will only be able to support a limited number of projects simultaneously due to their balance sheet capacity.

Currently construction contractors are extremely busy due to the large infrastructure pipeline outlined in Section 4.3, leading to constraints across both workforce and financial capacity. This is evidenced by cost increases[32] and contractors pulling out of projects where risk allocation is a concern[33].

In addition, several contractors have stopped operating in the renewable energy sector due to risk allocation concerns[34]. This leads to the conclusion that construction contractor capacity will be one of the key factors determining the ability to deliver the Roadmap within the required timeframes.

Table 12: Contractor Interventions and Opportunities

DESCRIPTION	SOURCE
Interventions	
Encourage new entrants and maximise participation by existing participants through targeted market engagement that seeks to understand constraints or opportunities to participating in Roadmap developments	• MBB Analysis & experience from Project EnergyConnect • TfNSW has used this strategy for its investment program
Marketing the Roadmap program to contractors to provide confidence that there is a significant pipeline of work under a	• MBB Analysis

[32] For example: https://infrastructuremagazine.com.au/2020/02/21/nsw-government-confirms-3-billion-sydney-metro-cost-blowout/
[33] For example: https://www.theage.com.au/national/victoria/building-consortium-set-to-withdraw-bid-for-north-east-link-20191220-p53lur.html
[34] https://www.pv-magazine-australia.com/2020/03/07/sterling-and-wilson-a-view-on-australias-epc-market/

DESCRIPTION	SOURCE
coordinated planner. This has been a successful approach for TfNSW transport projects in NSW	• TfNSW has used this strategy for its investment program
Explaining how the risk profile has changed – previously the risks around connection to the grid and registration of generators have deterred contractors and so any improvements to the risk profile may encourage contractors back into the market	• Market Engagement
Establishing training centres in partnership with industry in key regional locations to ensure skilled staff are available with the specific skills required for renewable energy development	• Market Engagement • Victorian Tunnelling Centre[35] • Victorian Renewable Energy Training Tower[36]
Ensuring planning and environmental approvals are streamlined and the relevant authorities have sufficient resources to process the expected volume of applications, as delays to these approvals are another key risk area for contractors	• Market Engagement
Identifying key skilled positions where there is likely to be a shortage (for example electrical / network engineers and linesmen) and providing study support or other incentives to encourage local students to enrol. For example, one developer in the market engagement commented that there were no network engineers trained in Australia, they all had to be brought in from India or other countries where they had been educated	• Market Engagement • MBB Analysis
Opportunities	
The size of the Roadmap program is sufficient to be of interest to new international contractors, encouraging them to enter the market. While this would not increase local workforce capacity immediately, international contractors develop a local workforce over time and will also bring additional balance sheet capacity into the market. Policy levers such as tender evaluation criteria can be leveraged to ensure that these contractors maximise the use of local content.	• MBB Analysis • TfNSW has used this strategy for its investment program • Project EnergyConnect

[35] Found here: https://holmesglen.edu.au/Industry/Victorian-Tunnelling-Centre/
[36] To be conducted by Federal University, Victoria. Source: https://www.acciona.com.au/updates/news/federation-university-to-build-australian-first-renewable-energy-training-tower/

DESCRIPTION	SOURCE
Care will need to be taken to ensure that any new international contractors understand the local market and are able to deliver as required under Australian workforce, WHS and Environmental requirements.	
Like the Victorian Tunnelling Centre and the Victorian Renewable Energy Training Tower in Ballarat[37], a purpose-built facility operated in partnership with industry to train workforce in specialist skills in renewable / transmission construction techniques could provide significant increases in workforce capacity, as well as providing training for the workforce in other states to recoup investment costs	• Market Engagement • Victorian Tunnelling Centre • Victorian Renewable Energy Training Tower
Providing a longer-term pipeline for contractors will encourage investment in training of the local workforce rather than importing experienced workers on short term contracts, as contractors will see that their workforce may be utilised over a series of projects	• Market Engagement

6.3. Manufacturers

Renewable energy and transmission projects typically require significant volumes of specialist high-technology equipment, including:

- Solar panels
- Wind turbines
- Rotor blades
- Water turbines (pumped hydro)
- Batteries
- Inverters
- Substation equipment (e.g. transformers)

As well as high volumes of commodity products, such as:

- Conductors / cables
- Steel

[37] https://www.abc.net.au/news/2021-04-28/australias-first-renewable-energy-training-tower-ballarat/100101290

- Concrete
- Wind turbine towers

Specialist high technology equipment manufacturing is generally large volume by international players with an integrated global supply chain, with some local manufacturing / assembly capability[38]. Due to the integrated nature of the worldwide supply chain, in some instances it will not be possible to set up a complete supply chain locally for complex equipment, rather this would be local manufacturing of a specific component or assembly of components imported from overseas into a final product.

For some items, a production 'slot' needs to be booked in the factory well in advance (up to 12 months) to ensure timely delivery, however with sufficient planning MBB expects that these areas will not be capacity constrained (although the logistics capacity to transport volumes of very large equipment from ports to regional construction sites may be constrained).

One area of risk is around concentration of suppliers in a limited number of companies / countries, which can result in disruption to the supply chain from unexpected events. One particular concern in the market engagement (set out in **Appendix 5**) was the dominance of China in the supply chain for items such as solar modules and wind turbines and their willingness to impose cost increases on contracts after they have been signed.

One market engagement participant identified that some manufacturing facilities set up locally do minimal work assembling items imported from overseas and that audits or monitoring are required to ensure that local participation commitments are being met and to ensure that commitments include a longer term plan to increase local content back through the supply chain.

Market engagement indicated that cost and availability of shipping to transport key items to Australia is currently extremely constrained. Participants commented that the cost of shipping containers had tripled over recent years. This is jointly driven by capacity issues within the shipping industry and by the impacts of COVID-19. While the impacts of COVID-19 will unwind in the next couple of years, shipping capacity is expected to remain constrained.

The commodity products are also generally large volume, with a mixture of local and international manufacturers. A key focus is minimising overall cost to the project through optimising potential cost savings from international production against transport costs. MBB does not expect commodity products to provide a constraint to delivery of the Roadmap as there are a diverse set of suppliers.

Many of the key components of renewable energy development require the use of commodity metals (copper, aluminium) and rare earth elements (lithium, nickel, cobalt, manganese, graphite). As worldwide commitments to introduce renewable energy continue to increase, demand for these materials will also increase, potentially leading to shortages or increases in cost for these raw materials. The International Energy Agency estimates that to meet the goals of the Paris Agreement, the current demand for minerals

[38] For example, Vestas has set up a turbine assembly plant in Geelong at a former Ford Motor factory. https://reneweconomy.com.au/vestas-brings-winds-of-change-to-victoria-manufacturing-with-turbine-plant-in-geelong-12702/

for clean energy technologies would increase by a factor of four[39]. Under this scenario, expected supply for existing mines and projects under construction would meet only half of the projected lithium and cobalt requirements and 80% of the copper requirements by 2030.

Table 13: Manufacturer Interventions and Opportunities

DESCRIPTION	SOURCE
Interventions	
Provide certainty on the pipeline so that all elements of the supply chain are confident in investing to meet future demand. This would be through firm government commitments to projects as well as undertaking market engagement / roadshows to ensure that manufacturers understand the pipeline	• Market Engagement
Putting in place incentives / frameworks to encourage material recycling industries to develop that can recover and recycle the key materials from life-expired facilities or equipment. This will reduce the need for additional mines to source new material as well as reducing the environmental impact of the infrastructure. In addition, the new recycling industry will create additional jobs within NSW that may otherwise be created interstate or overseas	• Market Engagement • International Energy Agency[40] • MBB Analysis
Working with current local manufacturers to encourage expansion ahead of time. This could include facilitation of loans to fund expansion of facilities, identification of skills gaps and facilitating discussions between developers and local manufacturers to ensure there is a full understanding of local capabilities	• Market Engagement
For government-led procurements (for example transmission), ensure that key items of equipment are identified early, and suppliers contacted to understand their lead times to deliver. Some large electrical equipment such as phase shift transformers and synchronous condensers can require orders over a year in advance to secure a manufacturing slot	• MBB Analysis & experience from Project EnergyConnect
Facilitating engagement between contractors / developers and local manufacturers that may be able to develop new designs using advanced manufacturing techniques that compete with imported products	• Market Engagement

[39] *The Role of Critical Minerals in Clean Energy Transitions*, International Energy Agency, May 2021

[40] *The Role of Critical Minerals in Clean Energy Transitions*, International Energy Agency, May 2021

DESCRIPTION	SOURCE
Opportunities	
New industries will be created (for example recycling and recovery of life-expired equipment). Targeted interventions such as development of innovation precincts or mandating local processing of locally produced waste could encourage a local industry that could provide services to the rest of Australia	• MBB Analysis
Working with large manufacturers to explore opportunities to develop local manufacturing facilities to service local needs, potentially driven through local content requirements when contracting with developers. Care needs to be taken to ensure that material value add is undertaken locally rather than 'token' assembly of overseas components	• MBB Analysis • Market Engagement • Vestas Geelong Turbine Assembly Facility[41]
Key items that have potential for local production include transformer and other electrical equipment, conductors, wind turbine towers and local assembly of wind turbine nacelles. Further engagement with local manufacturers may identify further opportunities	• Market Engagement

6.4. Advisors

Complex projects such as renewable energy and transmission development typically use a range of professional advisors or subject matter experts to assist in specialist areas. These can include:

- Design and operating strategy
- System studies and planning
- Financial and commercial arrangements
- Legal advice
- Procurement
- Construction monitoring
- Environmental and planning approvals

[41] https://reneweconomy.com.au/vestas-brings-winds-of-change-to-victoria-manufacturing-with-turbine-plant-in-geelong-12702/

Typically, advisors play a small part in the development of each project and do not require a large workforce for a single project. Where there are many projects being developed simultaneously, capacity issues may emerge, particularly if the volume increases more rapidly than new staff can be hired. Electrical engineers with experience modelling high voltage networks have been identified in the market engagement as a key area where there is a shortfall in capability / capacity in Australia. Apart from this, advisor capacity is not expected to be a constraint to delivering the Roadmap.

Table 14: Advisor Interventions

DESCRIPTION	SOURCE
Interventions	
Providing details of the pipeline to the advisor market so they can plan / prepare for the increased volume	• MBB Analysis • Market Engagement
Work with universities to identify reasons for the lack of electrical engineering graduates with network modelling experience (for example industry scholarships, materials for careers advisors)	• Market Engagement

6.5. Financiers

Due to the current injections of liquidity into the financial markets by governments around the world, there are substantial funds available to investors and banks to invest into projects. Key to ensuring that sufficient finance is available is to ensure that risk allocation for projects is attractive for investors (similar to the discussion for developers in Section 6.1).

MBB does not expect financiers to be a constraint to delivering the Roadmap.

6.6. Approvals / Connections

6.6.1. AEMO / TransGrid

Implementing the Roadmap will result in a significantly higher volume of connection agreements and registrations to be processed by AEMO / TransGrid. There are already delays being seen in obtaining connection agreements and registrations due to the extensive network modelling required for each application, which is seen as a major risk by developers and contractors[42]. Without investment / interventions by AEMO / TransGrid, it is expected that approvals may constrain the ability to deliver the Roadmap in a timely manner, both through the logistics of making approvals and from industry having confidence to invest.

Table 15: AEMO / TransGrid Interventions

DESCRIPTION	SOURCE
Interventions	
Ensuring that AEMO / TransGrid understand the increased future workload and increase staff levels appropriately, and refining connection and registration processes, systems and requirements	• Market Engagement
Setting KPI standards for response times on connection agreements and registrations to provide certainty to developers / contractors over the timing of the process	• MBB Analysis
Performing scenario planning and preparatory analysis based on market appetite and system topology needs for each of the Renewable Energy Zones in advance of development of the infrastructure	• Market Engagement

6.6.2. DPIE

Implementing the Roadmap will result in a significantly higher volume of planning and environmental approvals to be processed by DPIE, which could introduce delays for development of projects. Without investment / interventions by DPIE, the timing of approvals may constrain the ability to deliver the Roadmap in a timely manner.

[42] https://reneweconomy.com.au/tilt-says-clarity-needed-as-grid-connection-delays-threaten-australia-investment-46278/

Table 16: DPIE Interventions

DESCRIPTION	SOURCE
Interventions	
Ensuring that DPIE increase staff levels appropriately to maintain timelines for planning and environmental approvals	• Market Engagement • MBB Analysis
Setting KPI standards for response times on approvals to provide certainty to developers / contractors over the timing of the process	• MBB Analysis

6.7. Development Pathway

As discussed in Section 4.3, there is forecast peak demand in the transport sector over the next 5 years. Transport civil construction is a mature industry that has been delivering a large volume of major projects within NSW and Australia for the last 5 years. Over this time, there has been a strong focus on capacity building in the workforce and throughout the supply chain to ensure capacity to deliver the works and meet peak construction[43].

Despite these investments in supply chain capability and capability, the industry is experiencing significant cost escalation due to increased demand in civil construction driven by the volume of work[44].

Given the similar scale of electricity infrastructure investment being planned for NSW, shown in Figure 8, and the overlap with peak transport construction, it is arguable that the market will struggle to meet Roadmap demand within required timeframes without Government interventions.

Without consideration of market capacity when structuring the development pathway for the Roadmap, the desired outcomes for greater local participation and for a cost-efficient investment for consumers may not be met. For example:

- Rollout of the Roadmap may create a boom / bust scenario if the supply chain ramps up quickly for 2-3 years and is left with excess labour while activity returns to normal levels. The likely mitigation response from construction contractors based on MBB's experience in the infrastructure sector will be to utilise experienced FIFO international resources or interstate staff on temporary contracts.

[43] Some examples are set out in Appendix 3

[44] For example: https://infrastructuremagazine.com.au/2020/02/21/nsw-government-confirms-3-billion-sydney-metro-cost-blowout/

- If the rollout is compressed into a short period, then local supply capacity may be exceeded (both in workforce and in manufacturing), resulting in temporary workers being brought into the country, supplies being sourced overseas, or cost increases.
- There are risks to delivering within Roadmap timeframes if construction is compressed into a short period leading up to 2030, as illustrated in the investment profile shown in Figure 9. Any delay during construction could result in a failure to achieve legislative requirements as there is no capacity in the market to 'catch up' and no buffer period to allow for the delays.

The most preferable development pathway is one that builds investment in a gradual manner to a plateau that is maintained until all investment under the Roadmap is complete. The Staged Rollout approach shown in Figure 8 demonstrates this approach. Investment is ramped up over 2 years to reach a level of $4 billion to $5 billion per year from 2024 to 2029. The key factors to consider when setting the approach are:

- Investment in transmission should commence as soon as practically possible. Completion of transmission is the key to allowing investment in generation and storage to commence.
- Transmission projects should be staggered over time. This will allow developers / contractors to focus on bidding for a single project at a time, and reduce the peak capacity required in the transmission construction industry.
- Connections / registrations for generator and storage developers should be rationed (for example by releasing a certain amount of capacity each year through reverse auctions). This will allow government to control the level of investment to produce a more optimal profile.

6.7.1. Maximum Rate of Development

Under the Staged Rollout approach shown in Figure 8, spending would be almost $5 billion per year, mostly in regional areas. By way of comparison, the Inland Rail project is spending ~$1.5 billion per year over 10 years[45] and is considered a very large project for regional areas that requires close monitoring of the supply chain. For this reason, MBB believes that the rate of investment forecast under the Staged Rollout approach ($5 billion per year) would be the limit of what is achievable and efficient. As shown in the Staged Rollout profile in Figure 6, this level of investment is equivalent to generation capacity increases of 2 to 3 GW per year.

The maximum rate of development should be reviewed over time as the local supply market builds capacity to meet the proposed pipeline and the effect of any government interventions is reflected in the market.

[45] https://infrastructurepipeline.org/project/inland-rail-freight-corridor

6.7.2. Dependencies

The development pathway should consider several key dependencies to ensure that the program can be delivered:

- Significant private sector investment in generation and storage / firming is unlikely to occur until construction has started on transmission network infrastructure (within REZs), as a key risk for developers is being able to connect to the electricity transmission network.
- In regional areas, road and communication upgrades may be required to facilitate projects. This is particularly the case where large pieces of equipment are being installed (e.g. wind turbines / transformers), as they may exceed the capacity of rural bridges. Government may be able to play a role in coordinating the market in delivering these upgrades on a whole of region basis rather than being undertaken in a piecemeal fashion by individual projects.
- To ensure an efficient development of the market, DPIE may need to 'ration' construction of generation / storage to avoid peaks and troughs. For example, through limiting the megawatts of capacity in reverse auctions to connect to Renewable Energy Zones. Without rationing, developers are likely to rush to build their project and obtain connection before capacity runs out, leading to a peak of construction as soon as the REZ is certain to be built.
- There is a tension between bringing forward investment to provide a smooth investment profile for industry, and that the cost of some components are reducing at a significant rate (5%-10% per year for solar panels / batteries)[46]. Significant cost reductions over time would suggest leaving the investment to the latest possible time would be most efficient, however this needs to be weighed against industry's ability to deliver the rate of investment required.

[46] Calculated from CSIRO GenCost 2020-21 Consultation Draft

7 Supply Chain Opportunities

7.1. Opportunities

Through the market engagement process summarised in **Appendix 5**, the capability, capacity and cost effectiveness of the local supply chain was investigated. Based on the feedback from market engagement, Table 17 provides a summary of the current local supply capability, opportunities for development of new local supply chains and areas of the supply chain that are not considered unfeasible for development.

Appendix 1 provides examples of companies that are currently operating in the supply chain and an indication of the current proportion of each component in the supply chain that is locally supplied.

Table 17: Local Supply Chain Opportunities

Current Local Supply	Opportunity for Development	Not Feasible
SOLAR GENERATION		
• Civil & Earthworks • Concrete • Reinforced Steel – Foundations • Worker Camps	• Steel Tracker Frames • Tracking Motors • Steel Foundation Pile • Low Voltage Cabling • Piling and Trenching Machinery • Offsite Prefabrication of Arrays	• Photovoltaic Module
WIND GENERATION		
• Civil & Earthworks • Concrete • Reinforced Steel – Foundations • Low voltage cabling • Anchor Cages • Large Hold Down Bolts • Wind Turbine Assembly • Worker Camps	• Wind Towers[47] • Nacelles • Noise Monitoring Equipment	• Wind Turbine Gearbox • Blades

[47] MBB note that wind towers are currently manufactured in Victoria however Participants are concerned about the capacity to meet future demand

Current Local Supply	Opportunity for Development	Not Feasible
PUMPED HYDRO		
• Civil & Earthworks • Concrete • Reinforced Steel – Foundations • Aggregates • Transformers • Steel Pipes • Large Hold Down Bolts • Worker Camps	• Inverter Skids	• Turbines • Generators • Inverters
BATTERIES		
• Civil & Earthworks • Concrete • Reinforced Steel – Foundations • Transformers • Worker Camps	• Inverter Skids • Battery Cell Module	• Inverters
TRANSMISSION NETWORK		
• Transformers (<330kV) • Custom Screw Pilings • Worker Camps	• Lattice Towers • Guyed Towers • Monopoles • Low Voltage Cabling	• High Voltage Cabling • Inverters • Transformers (>330kV)

7.2. Opportunities outside the Roadmap

The market engagement identified two potential opportunities for the State to facilitate decarbonisation of the economy that may fall outside of the scope of the Roadmap. Private industry is driving market outcomes in these two areas at pace - with either no reliance on regulated transmission networks or strategies that involve lower risk use of the existing energy network infrastructure.

Both Green Hydrogen and Offshore Wind are large scale opportunities that utilise an equivalent supply chain to that considered by the Roadmap. Government can avoid negative outcomes such as capacity constraints or cost increases with consultation and collaboration with developers in both emerging technologies. A coordinated approach can identify and realise complementary opportunities to drive greater local content through economies of scale and sharing of resources.

It is recommended that further engagement with both industries be undertaken to better understand specific assistance needed to ensure the achievement of objectives that increase and assure local content, Australian jobs, training and the establishment of a coordinated approach to the use and development of capabilities sustainably and efficiently.

7.2.1. Green hydrogen

This sector uses renewable energy such as solar PV and wind generation to manufacture hydrogen. The hydrogen is then exported for fuel (for example for hydrogen powered cars). The generation is typically not connected to the grid, rather it is connected directly to the hydrogen manufacturing plant, hence is unlikely to contribute to achieving the objectives of the Roadmap.

While not serving as a solution to the energy transition dilemma, green hydrogen will create a potential for competition for capacity in the supply chain and absorbing industry investment, local jobs and market attention away from the Roadmap. The opportunity is that this could be used as a driver of urgency to obtain the necessary focus and attention from within NSW government, to help drive initiatives to increase supply chain capacity. If not managed with sufficient urgency, there may be lowered market appetite for engagement in more complex and less certain REZ projects.

7.2.2. Offshore Wind

Market engagement participants believed that offshore wind could create new market capability in the emerging technology of floating foundations - designs and construction techniques and that this could create sought-after international skills and capabilities. These skills could be leveraged as a future centre of excellence in the global offshore wind market. Offshore wind projects identified during the market engagement are located in Commonwealth waters and so may not be counted towards achieving the Roadmap's objectives.

The opportunity is for the NSW Government to support the development of this industry through targeted interventions such as creation of an excellence hub and facilitation of engagement between local industry and developers to ensure that local capabilities can be fully utilised and can be applied to export opportunities.

7.3. Cost Impacts

To demonstrate that any interventions are in the best interests of electricity consumers, one of the questions in the market engagement covered participants' views on the cost impacts of higher local participation in the supply chain. Most comments were qualitative as there is not a substantial amount of data available on the relative costs of local and international supply chains (for example in many areas where imported goods are used there are no local Australian manufacturers). The key points raised were:

- Labour costs are higher in Australia, which means manufacturing is typically not competitive unless there is a high level of automation
- Electricity costs are higher in Australia, which also means manufacturing is less competitive
- Sourcing local supplies can reduce supply chain risk as there is less risk of delays / misunderstanding of specifications with local manufacturers
- The reason many developers use offshore suppliers is cost differences, with many projects being marginal and so cost increases could make a project unviable

- Quality assurance, WHS standards, lower maintenance costs and being able to quickly make changes if something goes wrong were reasons why local manufacturers could sustain higher prices. Developers / contractors indicated that ~10% higher prices could be justified, but over that there would be no alternative to sourcing internationally

8 Recommendations

MBB recommends that DPIE take a holistic view of the development challenges and opportunities to ensure that actions taken today result in the desired outcomes over the legislated timeline. It is clear from the consultation undertaken that the supply chain considers a range of activities as important to attract investment, give project certainty, achieve sustainable job creation and develop potential centres of excellence in NSW. Based on the analysis of constraints and opportunities validated during market engagement, MBB's recommendations are summarised below.[48]

Table 18: Recommendations

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
1. Facilitate a Sustainable Rollout of the Roadmap				
Measures should be taken to ensure that the investment to deliver the Roadmap is undertaken in a manner to allow a sustainable market to develop. This would reduce the risk of excessive cost escalation as well as encouraging long term development of the workforce and supply chain through training and local manufacturing.	As discussed in Section 6.7, the key outcomes would be: • A smooth investment profile, limiting peaks and troughs • Investment ramp up over ~2 years and is spread over time so that local industry can prepare	Market Engagement, MBB Analysis. TfNSW has attempted to use this approach (for example staging of	DPIE – Consumer Trustee / Infrastructure Planner	For CWO REZ (as the first REZ), planning for the potential staging of generation should commence immediately. Other REZs planning would need to be undertaken 12-24 months in advance of

[48] References to Market Engagement are contained in **Appendix 5**, Case Studies are contained in **Appendix 4** and Example Interventions are contained in **Appendix 3**.

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
	• Annual investment of $4 billion to $5 billion (equivalent to 2 to 3 GW of capacity per year) appears sustainable • Investment in transmission should commence as early as possible - this is key to commencing all other investment • The sustainable rollout would be achieved through a staggered program of REZ transmission construction, and use of reverse auctions to ration additional capacity each year	Sydney Metro and WestConnex construction) Case Study – ACT Government Renewable Energy Program		commencing construction of transmission infrastructure to allow developers to begin planning.
There is an opportunity for the State to take a lead role in the development of the rules and processes related to generator connection / registration and network development. This would require the NSW Government to collaborate with the AEMC and AEMO to create a faster and more efficient process as a short-term objective.	• Collaboration would need to unpack any current or future regulatory initiatives and explore ways to streamline or modify 'usual' practice. • Modelling of network capacity and amount of generation that can be connected within each REZ needs to be undertaken well in advance of generator applications being received. • Agreeing development costs up front with TNSPs to provide certainty that they will be paid for development work, allowing transmission investment to progress.	Market Engagement, MBB Analysis and experience on Project EnergyConnect Case Study – OECD Developing Robust Pipelines for Low Carbon	DPIE / AEMC / AEMO	As soon as practicable – reaching consensus on new processes, implementing these processes and then developers applying and being granted registration / approval will take time and would need to be complete for CWO REZ in ~2024

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
	• Investigate opportunities to develop a contestable market for transmission development. Government would need to analyse regulatory and legal pathways, as well as engage with the market to understand their level of interest and any commercial concerns.	Infrastructure Report		
2. Provide Certainty to the Market				
DPIE should regularly engage with market to demonstrate the State's commitment to the Roadmap and ensure the supply chain can prepare for the scale of upcoming investment. The market engagement reinforced that clear signalling needs to be provided as to the extent of the Government's commitment.	• Roadshows, workshops and announcements should be developed to provide specific information including government initiatives, project locations, development value, timing of construction start and commissioning, and risk profiles. • Demonstrating that NSW is 'open for business and means business' are signals industry needs to see and that the plans formulated are backed and driven. • Development of a pipeline that can be articulated by government, within given uncertainty tolerances, will provide the market with the opportunity to plan, invest and to be	Market Engagement TfNSW has used this approach for its investment program Case Study – OECD Developing Robust Pipelines for Low Carbon Infrastructure Report	Consumer Trustee, Infrastructure Planner	Immediately. It will take several years for industry to increase capacity (for example through workforce training or investing in additional manufacturing facilities). With CWO REZ expected to start construction in 2023, industry would need to start planning within the next 6 months.

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
	ready for the growth opportunities and their associated timing. • The provision of greater certainty reduces the risk of constraints in the supply chain and increases confidence for the development of industry initiatives involving training, skills, local content and jobs creation. • It is important that nominated timescales are met to increase market confidence.	Case Study – ACT Government Renewable Energy Program		
3. Identify and Attract New Entrants				
DPIE should proactively identify potential new entrants to the market (both local or international) and approach them to discuss challenges and opportunities of investing in the Roadmap.	• Identification of potential new entrants (across all components of the supply chain) • Engagement with new entrants to understand challenges and opportunities as well as discuss timelines for investment and identify specific actions DPIE can take to facilitate market entry. • DPIE should also consider the value of an international roadshow, focused on key international markets, highlighting the low sovereign risk and escalating opportunities associated with the Roadmap.	Market Engagement TfNSW has used this approach for its investment program	DPIE Investment NSW	Immediately. It will take over a year for a new entrant to set up in Australia, identify a potential workforce / manufacturing sites and be ready to deliver major projects within the Roadmap. With CWO REZ expected to start construction in 2023, industry would need to

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
				start planning within the next 6 months.
4. Maximise Local Content				

DPIE should develop a strategy to maximise local content in Roadmap projects. This would be done through tender requirements for construction contracts / grid connection and registration as these are the areas where government can exert control over the process.	• Set local content requirements in tenders for transmission construction and in reverse auctions for generation / storage connections / registration:
	  o These need to be supported by detailed research into current local capacity and feasible increases in capacity
	  o Local content requirements should be both outcomes focused and target based
	  o Targets should ramp up to align with evidence of capability and capacity
	  o Reporting requirements should be simple and capable of compliance and audit
	  o Proponents should submit local participation plans to DPIE as part of the evaluation criteria and asked to self-nominate stretch targets, with evaluation scores based on level of local participation proposed
	  o Local content requirements should be defined clearly and separated between suppliers (goods and services) and employment (labour resources).
		Market Engagement
		Example interventions in **Appendix 3**
		Case Study – EnergyConnect – Development Phase Local Content Targets
		Case Study – Victorian Government Local Content Requirements
		Case Study – ACT Government
			DPIE	The detailed research and development of appropriate targets would need to be in place before tenders commence (for CWO REZ, transmission tenders are likely in early 2022, and generation reverse auction during 2023).

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
	Indigenous participation targets would be a subset of labour • Ensuring reporting and audit systems are in place during and post construction to ensure compliance with local content commitments. The appropriateness of penalties would also need to be addressed • Enforcing requirements for tenders to ensure a level playing field for local suppliers, for example: o Modern slavery o Quality certification o Environmental requirements o WHS requirements / accreditations throughout the supply chain	Renewable Energy Program Example Interventions - NorthConnex, Sydney Metro, Project EnergyConnect, Gold Coast Light Rail, Canberra Light Rail, New Submarine Construction		
DPIE should engage with industry to facilitate expansion of local capability	• Engage with international manufacturers about collaborating with local manufacturing facilities or establishing local assembly plants that could service NSW or the whole of Australia. A key driver to encourage development of local facilities is a clear local participation strategy demonstrating that without a local facility, the supplier may not be able to participate in the Roadmap. Care needs to be taken to ensure	Market Engagement, MBB Analysis Case Study – Snowy Hydro 2.0 Concrete Segment Factory	DPIE Investment NSW	Immediately. It will take over a year for industry to develop new facilities. With CWO REZ expected to start construction in 2023, industry would need to

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
	that material value add is undertaken locally rather than 'token' assembly of overseas components, noting that for complex machinery such as High Voltage network equipment, there is an interlinked worldwide supply chain which cannot be entirely replicated within Australia • Facilitation of loans to fund expansion of facilities, identification of skills gaps • Facilitating discussions between developers and local manufacturers to ensure there is a full understanding of local capabilities and manufacturers have an opportunity to develop new designs using advanced manufacturing techniques that compete with imported products • Talking to local manufacturers about increasing capacity in advance to be able to capture some of the investment	Case Study – BankWest Stadium		start planning within the next 6 months.
Government should consider supporting a local manufacturing pilot to increase capabilities and increase cooperation within the industry	• For example, BlueScope has offered space in its' Port Kembla facility for steel fabricators to set up facilities to manufacture components for renewable energy construction.	Market Engagement	DPIE Investment NSW	Immediately. It will take over a year for industry to develop new facilities. With CWO REZ expected to start

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
		Case Study – Denmark Local Value Chain		construction in 2023, industry would need to start planning within the next 6 months.
Putting in place incentives / frameworks to encourage material recycling industries to develop that can recover and recycle the key materials from life-expired facilities or equipment.	• Reduce the need for additional mines to source new material as well as reducing the environmental impact of the infrastructure. • The new recycling industry will create additional jobs within NSW that may otherwise be created interstate or overseas	Market Engagement, International Energy Agency[49], MBB Analysis Case Study – Denmark Local Value Chain	DPIE Investment NSW	This is a longer term initiative (2 years+), as major components of the renewable energy projects have lifespans of 10 to 30 years and so volumes for recycling are unlikely to be significant for a number of years.
5. Ensuring Timely Approvals				
Agencies will need to increase capacity to avoid unnecessary delays to developers. The market engagement identified that ensuring the timeliness of applicant	• The preferred outcome is for planning and environmental approvals, grid connections and	Market Engagement	DPIE, AEMO, TransGrid	Capacity would need to increase in line with the rollout of the Roadmap. The first Roadmap

[49] *The Role of Critical Minerals in Clean Energy Transitions*, International Energy Agency, May 2021

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
approvals and generator registration will underpin market confidence and pipeline planning to underscore the supply chain investment considerations.	registrations to be provided within a reasonable timeframe • DPIE, AEMO and TransGrid should examine the pipeline developed by DPIE and determine the level of internal resources needed to undertake the various approval processes			projects are expected to go through the approvals process in 2023, although significant rampup from current levels may not occur until the 2nd REZ commences construction.
6. Engage with the broader renewable energy community (participants and their projects)				
Engagement with developers in similar industries outside the Roadmap (offshore wind and green hydrogen) should be undertaken to better understand competing projects, the draw on the supply chain and local industry development and any opportunities for coordination or collaboration in respect to bolstering resource strategies and industry aggregation opportunities.	• DPIE to engage with developers in these industries to understand their plans and potential overlaps in requirements • Where there are similar skills / supply chains required, act in a coordination role to ensure that the supply chains are utilised efficiently and aware of future demand (for example including pipeline of offshore wind / green hydrogen in roadshow presentations) • Investigate collaboration in industry building initiatives such as joint training facilities	Market Engagement	DPIE	Offshore Wind / Green Hydrogen are a likely to be several years behind the Roadmap in terms of rollout. However, the earlier discussions can take place, the greater the level of cooperation that can be generated.
7. Lead a Coordinated Approach				

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
DPIE should consider the development of a centralised digital network or 'one-stop shop' for the Roadmap supply chain to provide participants with information about the program. This would assist industry in identifying and implementing initiatives to increase local content.	The centralised digital network could include: • Register of suppliers • Register of jobseekers / apprenticeship pool • Large crane availability • Training portal • Job portal • Timeline of projects in pipeline • Tender platform • Capability and capacity network • Lodge Reporting requirements • Upcoming Renewable Energy Sector events / roadshows • Announcements • Payment portal for contributions • Geotech or road studies depository This information could also extend across jurisdictions in Australia, as workforce and suppliers are not limited to one state and issues may be better resolved at a national level.	Market Engagement Case Study – OECD Developing Robust Pipelines for Low Carbon Infrastructure Report Industry Capability Network Case Study – BHP Local Buying Program Example Interventions – Snowy Hydro 2.0	DPIE	To maximise impact, this tool would be available to industry (and marketed) 12 months prior to commencement of construction of Roadmap projects. Supply chains are usually set well in advance of construction commencement and so the tool would need to be in place early to have an impact.

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
DPIE should consider the coordination of road upgrades across regions, including potentially collecting contributions from developers to help fund road upgrades. This would need collaboration with developers to map transport routes from ports and consultation local councils.	For each REZ, DPIE should: • Engage with developers and contractors to understand requirements for transport of equipment / materials into the region (volume / weights / oversize items) • Identify where there are parts of the transport network that act as limiting factors (for example bridges requiring strengthening / temporary bypasses of towns for oversize items) • Coordinate a response with developers / contractors / local councils (for example agreeing which bridges to upgrade and potentially collecting contributions from those projects that benefit)	Market Engagement	DPIE with input from industry and local councils	Any transport upgrades would need to be completed before construction commences on each REZ. For CWO this means that work should commence as soon as possible
Work with industry to identify skills gaps and consider supporting appropriate training programs through TAFE for example, to fill these gaps.	• Undertake studies to identify key areas where there are skills gaps or potential for a larger workforce to be trained. This should also cover which locations will require the workforce • Identify training courses that could be implemented and the location (for example in key regional centres located near each REZ)	Market Engagement Example Interventions – Sydney Metro, WestConnex, Canberra Light Rail, Victorian	DPIE Department of Education	Consultation should commence immediately. This recommendation has a long lead time, as trades can take over a year to become qualified, and professionals may need 3 or more years to

DESCRIPTION	PREFERRED OUTCOME / ACTIONS	SOURCE	RESPONSIBILITY	TIMING / PRIORITY
	• Identify the party best placed to deliver the course (for example, TAFE, private Registered Training Organisations or new 'centres of excellence') • Identify whether there are any specific facility requirements for the courses (for example towers / electrical installations to teach specific skills that would be required on renewable energy projects)	Tunnelling Centre		gain the relevant university degrees.

9 Conclusions

The Roadmap presents a significant opportunity for NSW Government to support the development of the local renewable energy supply chain to benefit NSW consumers. With total investment of up to $32 billion[50] by 2030, many sectors of the local supply chain can potentially reach the scale necessary to sustainably compete with international suppliers. However, significant coordination and investment is required to achieve this goal, for example:

- Providing appropriate training courses for the local workforce
- Enabling the local supply chain to increase capacity and capability to deliver goods and services required (for example facilitating investment in new facilities to deliver higher volume or new products)
- Coordination of the local supply chain to make it easier for developers to identify and utilise opportunities for local supply

Next steps for NSW Government should include analysing the potential interventions identified in this report to develop business cases for those that would make a positive impact to the State. This should be done expeditiously, as the investment in the Roadmap is expected to ramp up quickly and many of the interventions (such as training courses) can take a significant amount of time to set up and deliver

[50] https://www.energy.nsw.gov.au/government-and-regulation/electricity-infrastructure-roadmap

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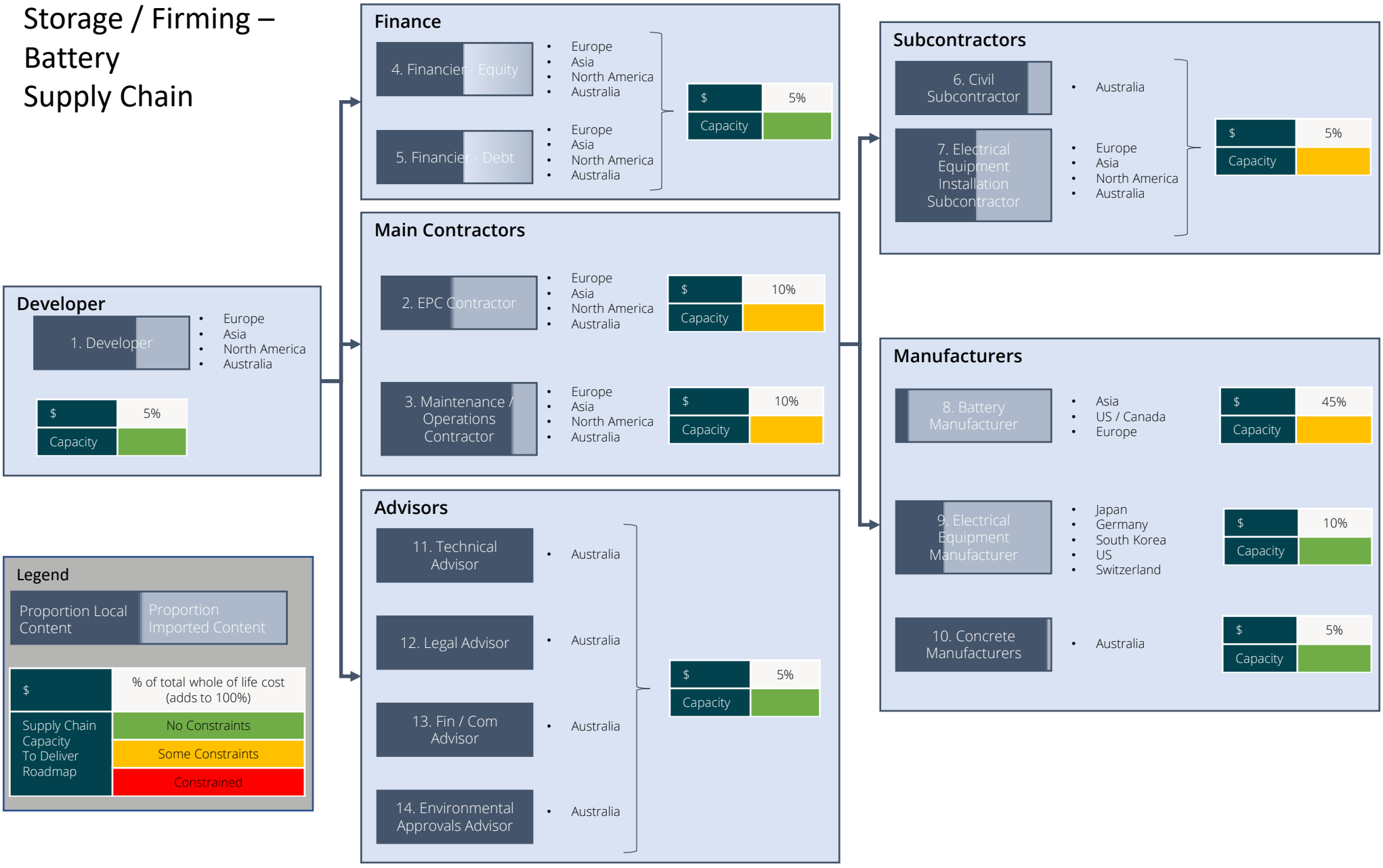
Appendix 1: Supply Chain Diagrams

Storage / Firming – Battery Supply Chain



Supply Chain Participant	Example Companies		Where Sourced
1. Developer	• Neoen • CEP Energy • Origin Energy • Fotowatio • Canadian Solar • UPC Renewables • Alinta Energy • Zen Energy		A mixture of local and international companies. On many projects, the developer will add batteries to a planned solar PV / wind project.
2. EPC Contractor	• Tesla • ABB • Consolidate Power Projects		A mixture of local and international companies. In many instances, the battery supplier undertakes installation of the batteries.
3. Maintenance / Operations Contractor	• AGL Energy • Beon Energy Solutions • Energy Australia		Typically, the developer or EPC contractor takes responsibility for maintenance / operations
4. Financier – Equity	• Developers • Infrastructure / green investment funds		A mixture of local and international companies
5. Financier – Debt	• ANZ • CBA • NAB • Westpac • Bank of China • Natixis	• Societe Generale • SMBC • MUFG • HSBC • Nord/LB	A mixture of local and international companies

Supply Chain Participant	Example Companies	Where Sourced
6. Civil Subcontractor	• Decmil • Sterling & Wilsons (self perform ~45% of work)	A mixture of local and international companies, typically Tier 2 or Tier 3.
7. Electrical Equipment Installation Subcontractor		Typically the EPC contractor undertakes the works without subcontracting
8. Battery Manufacturer	• Tesla • CellCube • Fluence • Wartsila • Samsung • Redflow • Panasonic • Lavo	The majority of batteries are imported from overseas, with Australian manufacturers typically small scale
9. Electrical Equipment Manufacturer	• ABB • Toshiba • Siemens • GE • Hyosung • Wilson Transformers	The majority of major electrical equipment is imported (Switzerland, Japan, Germany, US, South Korea)

Supply Chain Participant	Example Companies	Where Sourced
10. Concrete Manufacturer	• Boral • Holcim • Local / regional concrete suppliers	Typically sourced from local suppliers Volumes unlikely to be sufficient to warrant the EPC contractor setting up its own batch plant
11. Technical Advisor	• AECOM • Arcadis • GHD • Aurecon	Consultants are typically locally based professionals
12. Legal Advisor	• Allens • Ashurst • Clayton Utz • Freehills • King & Wood Mallesons • MinterEllison	Consultants are typically locally based professionals
13. Fin / Com Advisor	• Macquarie • MUFG • Deloitte • KPMG • PWC • EY	Consultants are typically locally based professionals
14. Environmental Approvals Advisor	• AECOM • WSP • Jacobs • Arcadis • EMM	Consultants are typically locally based professionals
Labour	• Individuals	Construction staffing is typically local employees or labour hire, supplemented by international employees where there are skills shortages or skills are not available in Australia Operations and maintenance staffing is typically local employees or labour hire as this work requires on the ground presence over a long period.

Information Sources

Whole of Life Cost Breakdown
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Supply Chain Capacity
- Market Engagement
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Local Content Proportion
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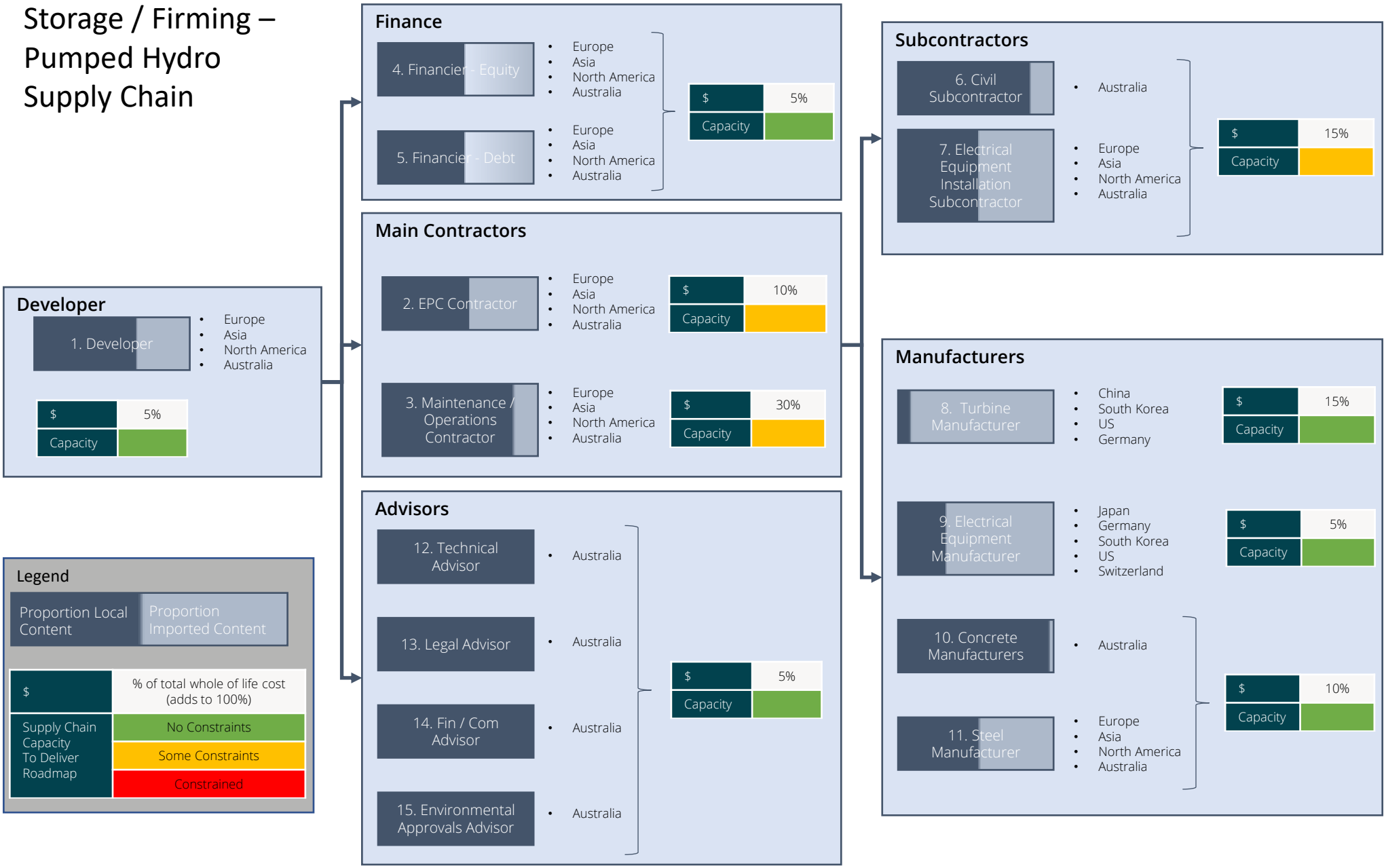
Storage / Firming – Pumped Hydro Supply Chain



Supply Chain Participant	Example Companies		Where Sourced
1. Developer	• ATCO • Alinta Energy • Hydro Tasmania • Snowy Hydro • Genex		A mixture of local and international companies
2. EPC Contractor	• McConnell Dowell • CPB • John Holland • Webuild • Laing O'Rourke		A mixture of local and international companies
3. Maintenance / Operations Contractor	• Entura • GE • Siemens • McConnell Dowell • CPB • John Holland • Webuild • Clough		A mixture of local and international companies Maintenance of turbines is usually linked to the original manufacturer
4. Financier – Equity	• Developers • Infrastructure / green investment funds		A mixture of local and international companies
5. Financier – Debt	• ANZ • CBA • NAB • Westpac • Bank of China • Natixis	• Societe Generale • SMBC • MUFG • HSBC • Nord/LB	A mixture of local and international companies

Supply Chain Participant	Example Companies	Where Sourced
6. Civil Subcontractor	• Voith Hydro • Downer • UGL • Fulton Hogan • BMD • Clough	Typically Australian based Tier 2 or Tier 3 contractors
7. Electrical Equipment Installation Subcontractor	• Downer • UGL • Elecnor	A mixture of large Australian specialist contractors and international specialist contractors
8. Turbine Manufacturer	• Voith Hydro • GE • Siemens • Andritz	The majority of turbines are manufactured overseas (as there has been little demand in Australia for a substantial period)
9. Electrical Equipment Manufacturer	• ABB • Toshiba • Siemens • GE • Hyosung • Wilson Transformers	The majority of major electrical equipment is imported (Switzerland, Japan, Germany, US, South Korea)

Supply Chain Participant	Example Companies	Where Sourced
10. Concrete Manufacturer	• Boral • Holcim • Local / regional concrete suppliers	Typically sourced from local suppliers Volumes unlikely to be sufficient to warrant the EPC contractor setting up its own batch plant
11. Steel Manufacturer – Steel Supply	• Many international suppliers • Bluescope • InfraBuild	A mixture of Australian and international suppliers
11. Steel Manufacturer – Fabrication	• Many international suppliers • Steel Mains • Precision Oxycut • Australian Steel Products	A mixture of Australian and international suppliers
12. Technical Advisor	• AECOM • Arcadis • GHD • Aurecon	Consultants are typically locally based professionals
13. Legal Advisor	• Allens • Ashurst • Clayton Utz • Freehills • King & Wood Mallesons • MinterEllison	Consultants are typically locally based professionals
14. Fin / Com Advisor	• Macquarie • MUFG • Deloitte • KPMG • PWC • EY	Consultants are typically locally based professionals
15. Environmental Approvals Advisor	• AECOM • WSP • Jacobs • Arcadis • EMM	Consultants are typically locally based professionals
Labour	• Individuals	Construction staffing is typically local employees or labour hire, supplemented by international employees where there are skills shortages or skills are not available in Australia Operations and maintenance staffing is typically local employees or labour hire as this work requires on the ground presence over a long period.

Information Sources

Whole of Life Cost Breakdown

- Cultana Pumped Hydro Project Knowledge Sharing Report – ARENA / ARUP / AREA / University of Melbourne / EnergyAustralia, September 2017

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- Market Engagement
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- MBB Analysis

Local Content Proportion

- Market Engagement
- MBB Analysis

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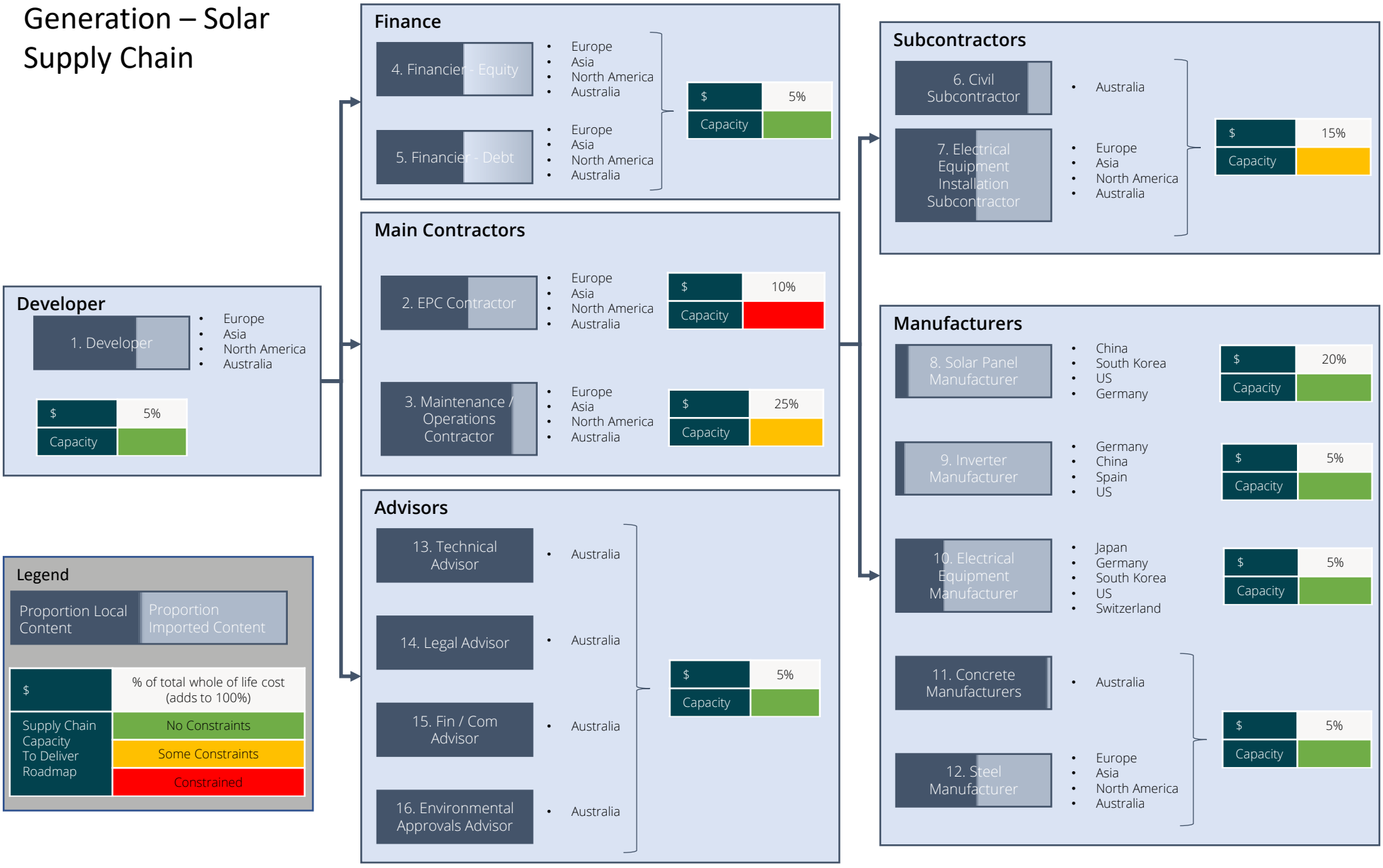
Generation – Solar Supply Chain



Supply Chain Participant	Example Companies		Where Sourced
1. Developer	• Neoen • ZEN Energy • SIMEC Energy • WIRSOL Energy • SolarQ	• Canadian Solar • UPC Renewables • DP Energy • Iberdrola • Reach Solar Energy	A mixture of local and international companies with experience and funding for developing solar generation
2. EPC Contractor	• Elecnor • Sterling & Wilsons • Bouygues • UGL • Signal Energy	• Beon • Gransolar • Canadian Solar • Belectric • CPS National	A mixture of local and international players. Recently several local players have pulled out of the EPC market due to risks around connection of projects to the grid (Downer / Tempo Services) and RCR Tomlinson collapsed in 2018 due to large losses on projects.
3. Maintenance / Operations Contractor	• Canadian Solar • SMA • Autonomous Energy • Reoam • Belectric • CPS National		A mixture of local and international players.
4. Financier – Equity	• Developers • Infrastructure / green investment funds		A mixture of local and international companies
5. Financier – Debt	• ANZ • CBA • NAB • Westpac • Bank of China • Natixis	• Societe Generale • SMBC • MUFG • HSBC • Nord/LB	A mixture of local and international companies

Supply Chain Participant	Example Companies	Where Sourced
6. Civil Subcontractor	• Decmil • Sterling & Wilsons (self perform ~45% of work)	Typically Australian based Tier 2 or Tier 3 contractors
7. Electrical Equipment Installation Subcontractor	• Downer • UGL • Elecnor • Autonomous Energy	A mixture of large Australian and international specialist contractors
8. Solar Panel Manufacturer	• SunPower • Tindo • Trina • Suntech • LG • Canadian Solar • Jinko • Hanwha Q Cells • First Solar	The majority of solar panels are imported (China, Korea, US, Germany) The only manufacturer in Australia is Tindo, which currently has capacity of 60MW per annum
9. Inverter Manufacturer	• SMA • SunGrow • Ingeteam • Huawei • ABB • Schneider • GE • Siemens	Practically all inverters are imported (China, Spain, US, Germany, Switzerland) SMA supplies a significant proportion of the inverters for utility scale solar producers in Australia and has formed a partnership with a local company to assemble parts in Australia
10. Electrical Equipment Manufacturer	• ABB • Toshiba • Siemens • GE • Hyosung • Wilson Transformers	The majority of major electrical equipment is imported (Switzerland, Japan, Germany, US, South Korea)

Supply Chain Participant	Example Companies	Where Sourced
11. Concrete Manufacturer	• Boral • Holcim • Local / regional concrete suppliers	Typically sourced from local suppliers Volumes unlikely to be sufficient to warrant the EPC contractor setting up its own batch plant
12. Steel Manufacturer - Steel Supply	• Many international suppliers • Bluescope • InfraBuild	A mixture of Australian and international suppliers
12. Steel Manufacturer - Fabrication	• Many international suppliers • Precision Oxycut • Australian Steel Products	A mixture of Australian and international suppliers
13. Technical Advisor	• AECOM • Arcadis • GHD • Aurecon	Consultants are typically locally based professionals
14. Legal Advisor	• Allens • Ashurst • Clayton Utz • Freehills • King & Wood Mallesons • MinterEllison	Consultants are typically locally based professionals
15. Fin / Com Advisor	• Macquarie • MUFG • Deloitte • KPMG • PWC • EY	Consultants are typically locally based professionals
16. Environmental Approvals Advisor	• AECOM • WSP • Jacobs • Arcadis • EMM	Consultants are typically locally based professionals
Labour	• Individuals	Construction staffing is typically local employees or labour hire, supplemented by international employees where there are skills shortages or skills are not available in Australia Operations and maintenance staffing is typically local employees or labour hire as this work requires on the ground presence over a long period.

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Supply Chain Capacity
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- MBB Analysis

Local Content Proportion
- Market Engagement
- MBB Analysis

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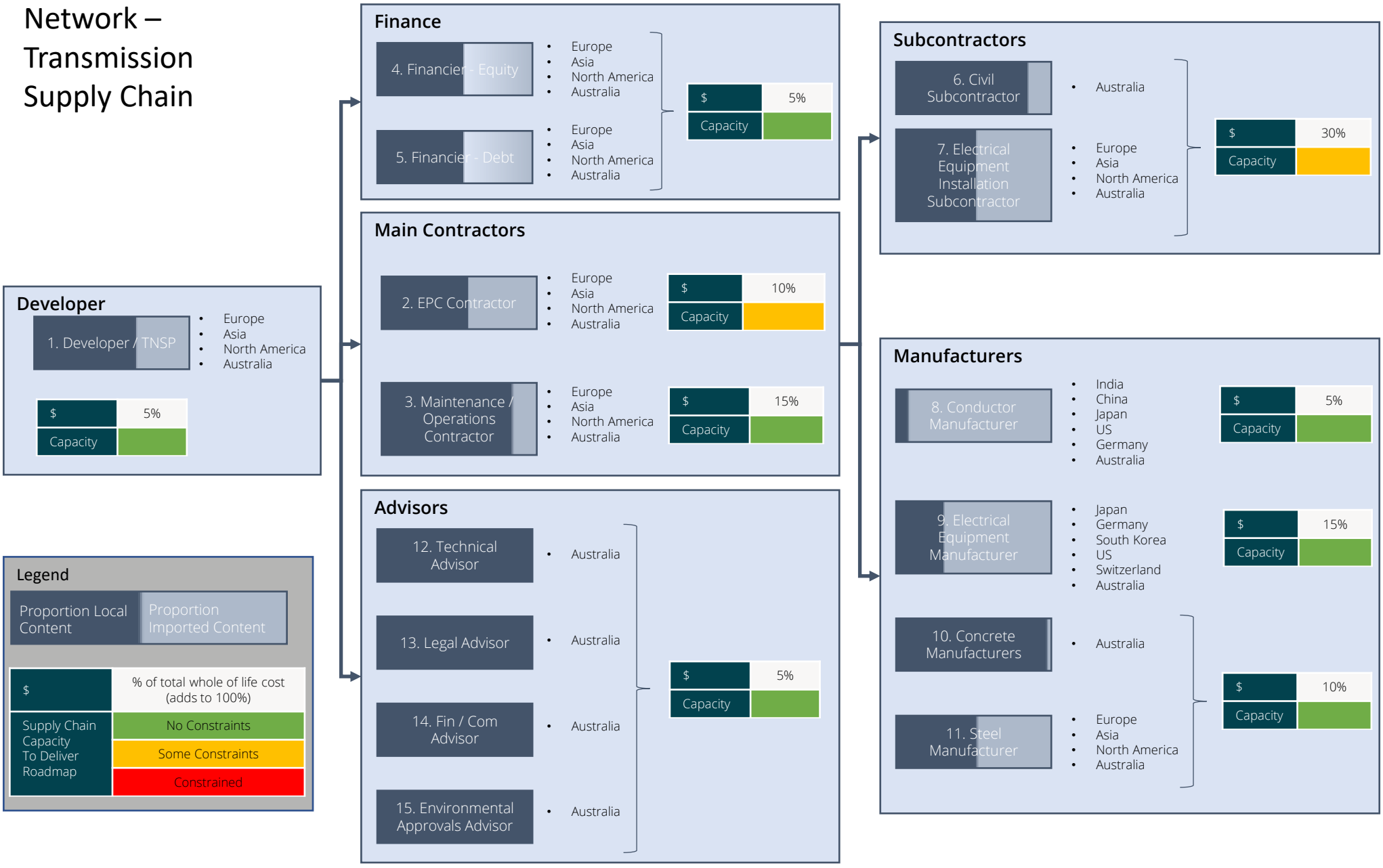
Network – Transmission Supply Chain



Supply Chain Participant	Example Companies		Where Sourced
1. Developer / TNSP	• Acciona • Goldwind • Epuron • AGL • TransGrid		Predominantly local players, although there is potential to grow/attract new international entrants if there was a pipeline of cost effective projects. Historically TransGrid as TNSP has undertaken the vast majority of high voltage transmission development, however several proposals have been put forward by other parties recently.
2. EPC Contractor	• CPB • UGL • Downer • Elecnor • Quanta • Acciona • Beon Energy Solutions • RES (Renewable Energy Systems)		A mixture of local and international companies
3. Maintenance / Operations Contractor	• CPB • UGL • Downer • Elecnor • Quanta • Acciona • RES (Renewable Energy Systems)		Typically, the same contractors that undertake construction also look to then perform the ongoing maintenance. Operations are undertaken by the TNSP for switching needed at the network connection, however, these companies can also provide operations services.
4. Financier – Equity	• Developers • Infrastructure / green investment funds		A mixture of local and international companies
5. Financier – Debt	• ANZ • CBA • NAB • Westpac • Bank of China • Natixis	• Societe Generale • SMBC • MUFG • HSBC • Nord/LB	A mixture of local and international companies

Supply Chain Participant	Example Companies	Where Sourced
6. Civil Subcontractor	• Clough • Downer • UGL • Fulton Hogan • BMD • Beon Energy Solutions	Typically, Australian based Tier 2 or Tier 3 contractors
7. Electrical Equipment Installation Subcontractor	• Downer • UGL • Elecnor • Quanta • Autonomous Energy • Beon Energy Solutions	A mixture of large Australian specialist contractors and international specialist contractors
8. Conductor Manufacturer	• Znergy Cable • Nexans • General Cable (Prysmian Group) • Furukawa Electric • APAR • Hengtong • LS Cable	The majority of conductors are manufactured overseas, as there has not been sufficient demand to justify significant local manufacture. Increased demand could bolster local manufacturing.
9. Electrical Equipment and supporting Infrastructure Manufacturer	• ABB • Toshiba • Siemens • GE • Hyundai Electric • Hyosung • Wilson Transformers • Tyree • Rocla • Ingal EPS	The majority of major electrical equipment is imported (Switzerland, Japan, Germany, US, South Korea) based on cost, however, local manufacture of major components such as Power Transformers (Wilson Transformers and Tyree) and poles (Rocla and Ingal EPS) are also examples.

Supply Chain Participant	Example Companies	Where Sourced
10. Concrete Manufacturer	• Boral • Holcim • Local / regional concrete suppliers	Typically sourced from local suppliers Volumes unlikely to be sufficient to warrant the EPC contractor setting up its own batch plant
11. Steel Manufacturer – Steel Supply	• Many international suppliers • Bluescope • InfraBuild	A mixture of Australian and international suppliers
11. Steel Manufacturer - Fabrication	• Many international suppliers • Precision Oxycut • Australian Steel Products	A mixture of Australian and international suppliers
12. Technical Advisor	• AECOM • Arcadis • GHD • Aurecon	Consultants are typically locally based professionals
13. Legal Advisor	• Allens • Ashurst • Clayton Utz • Freehills • King & Wood Mallesons • MinterEllison	Consultants are typically locally based professionals
14. Fin / Com Advisor	• Macquarie • MUFG • Deloitte • KPMG • PWC • EY	Consultants are typically locally based professionals
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Labour	• Individuals	Construction staffing is typically local employees or labour hire, supplemented by international employees where there are skills shortages or skills are not available in Australia Operations and maintenance staffing is typically local employees or labour hire as this work requires on the ground presence over a long period.

Information Sources

Whole of Life Cost Breakdown
- MBB Experience from previous projects

Supply Chain Capacity
- Market Engagement
- MBB Analysis

Local Content Proportion
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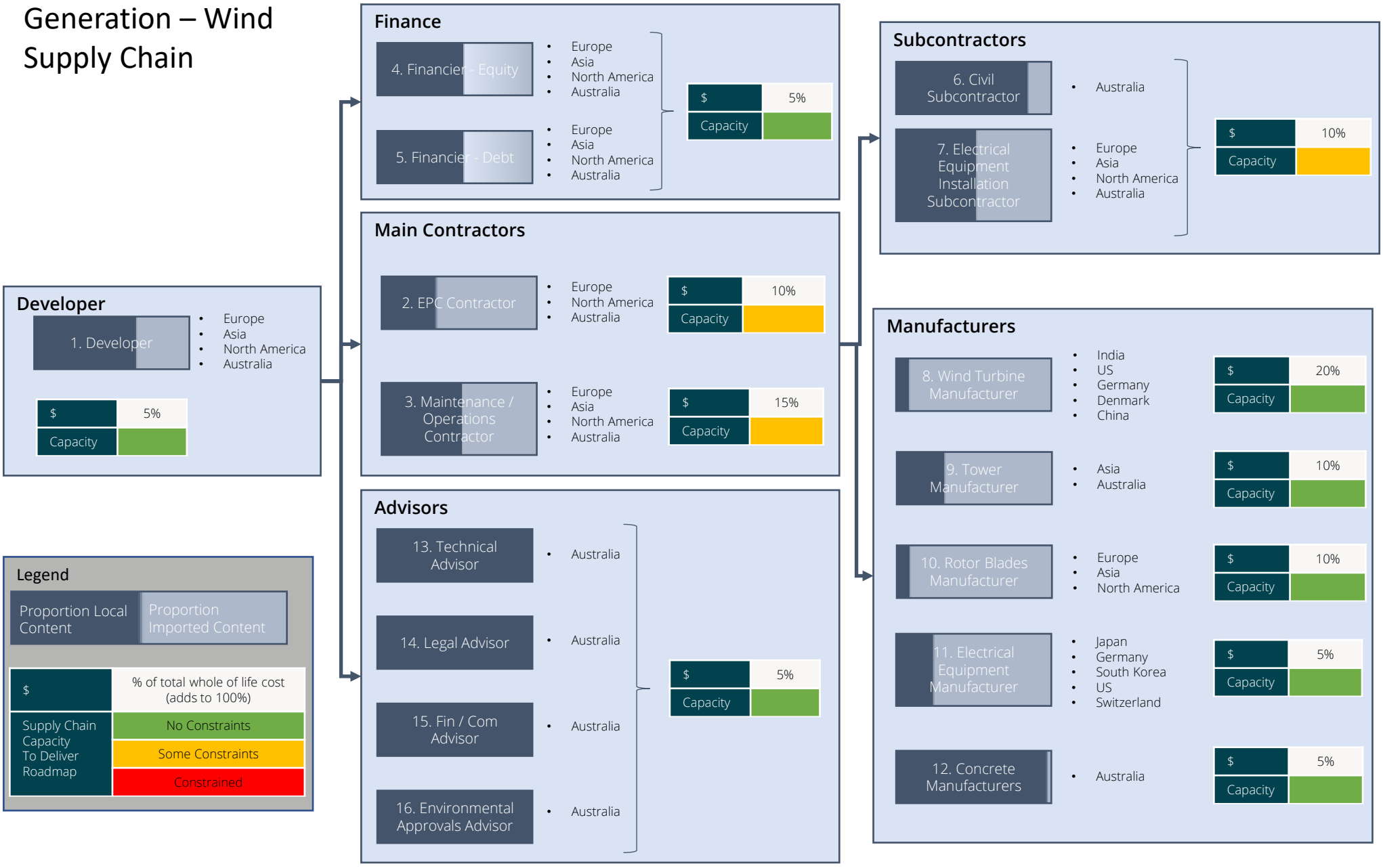
Generation – Wind Supply Chain



Supply Chain Participant	Example Companies		Where Sourced
1. Developer	• NEOEN • Siemens • Cleansight • Star of the South • Acciona • Vestas Energy • Wind Energy Partners • AGL Energy • Bright Energy Investments • APA Group	• CWP Renewables • Lacour Energy • Goldwind Australia • Tilt Renewables • Ratch Australia • Epuron • Windlab • ICG • Partners Group • John Laing • Origin Energy	A mixture of local and international companies with experience and funding for developing wind farms. Note that Acciona have been both the developer and the EPC contractor on projects.
2. EPC Contractor	• Acciona • GE • Goldwind Australia • Downer • Suzlon Energy Australia • Zenviron • Catcon		Generally, a consortium is formed between equipment manufacturers and civil contractors to deliver a turnkey project under an EPC contract. In many cases, the turbine manufacturer acts as the EPC contractor as the turbine makes up a high proportion of the capital cost.
3. Maintenance / Operations Contractor	• GE • Siemens • Vestas • Suzlon		Generally, the equipment manufacturer from the EPC consortium will become the O&M contractor once the project is commissioned. Practically all wind turbines manufacturers are based overseas.
4. Financier – Equity	• Developers • Infrastructure / green investment funds		A mixture of local and international companies
5. Financier – Debt	• ANZ • CBA • NAB • Westpac • Bank of China • Natixis	• Societe Generale • SMBC • MUFG • HSBC • Nord/LB	A mixture of local and international companies

Supply Chain Participant	Example Companies	Where Sourced
6. Civil Subcontractor	• Catcon • Downer • UGL • Laing O'Rourke • CIMIC	Typically Australian based Tier 1 or Tier 2 contractors
7. Electrical Equipment Installation Subcontractor	• Downer • UGL • Elecnor • Autonomous Energy	A mixture of large Australian specialist contractors and international specialist contractors
8. Wind Turbine Manufacturer	• GE • Siemens • Vestas / Marand Precision Engineering (VIC) • Suzlon • Goldwind	Practically all wind turbines manufacturers are based overseas. Supply chains have been disrupted by COVID-19, but are expected to return to normal over the next 12 months Previously some manufacturers have developed relationships with local industry to assemble turbines in Australia
9. Tower Manufacturer	• Keppel Prince • Crisp Bros. & Haywards • Shanghai Taisheng Wind Power Equipment	A mixture of Australian and Asian manufacturers construct towers. Asian manufacturers typically have lower costs (allowing for transport costs), and use of Australian manufacturers is typically driven by local content requirements.
10. Rotor Blades Manufacturer	• GE • Acciona • Enercon • Mingyang Smart Energy Group • Siemens	Typically rotor blades are imported from overseas. In the early 2000s, Vestas attempted to set up a local manufacturing facility, however uncertainty over renewable energy targets meant that the operation was abandoned.

Supply Chain Participant	Example Companies	Where Sourced
11. Electrical Equipment Manufacturer	• ABB • Toshiba • Siemens • GE • Hyosung • Wilsons Transformers	The majority of major electrical equipment is imported (Switzerland, Japan, Germany, US, South Korea)
12. Concrete Manufacturer	• Boral • Holcim • Local / regional concrete suppliers	Typically sourced from local suppliers Volumes unlikely to be sufficient to warrant the EPC contractor setting up its own batch plant
13. Technical Advisor	• AECOM • Arcadis • GHD • Aurecon	Consultants are typically locally based professionals
14. Legal Advisor	• Allens • Ashurst • Clayton Utz • Freehills • King & Wood Mallesons • MinterEllison	Consultants are typically locally based professionals
15. Fin / Com Advisor	• Macquarie • MUFG • Deloitte • KPMG • PWC • EY	Consultants are typically locally based professionals
16. Environmental Approvals Advisor	• AECOM • WSP • Jacobs • Arcadis • EMM	Consultants are typically locally based professionals
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Appendix 2: Spending Profile by Cost Category

Phased Rollout

Spend by Category ($m)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Developer	-	42	93	232	310	262	344	331	247	95	102	135
Finance	-	42	93	232	310	262	344	331	247	95	102	135
EPC	-	84	186	464	619	524	689	663	494	190	204	269
Advisors	-	42	93	232	310	262	344	331	247	95	102	135
Subcontractors	-	253	554	919	1,014	1,015	1,240	1,073	642	266	305	370
Battery Manufacturer	-	-	8	5	3	4	2	3	2	3	-	-
Turbine Manufacturer	-	-	-	124	332	382	258	50	-	-	-	-
Solar Panel Manufacturer	-	-	-	233	222	-	489	621	591	141	238	238
Inverter Manufacturer	-	-	-	58	55	-	122	155	148	35	60	60
Conductor Manufacturer	-	42	92	89	57	91	86	60	-	10	10	10
Wind Turbine Manufacturer	-	-	-	172	343	171	199	397	396	198	130	259
Rotor Blades Manufacturer	-	-	-	86	172	86	100	199	198	99	65	130
Electrical Equipment Manufacturer	-	126	278	411	424	445	516	451	247	116	123	155
Concrete / Steel Manufacturer	-	84	185	449	649	566	616	606	445	204	177	274
Cogen / Biogas	-	-	-	-	-	-	-	17	33	50	50	50
Total	-	716	1,582	3,707	4,820	4,068	5,351	5,289	3,939	1,598	1,667	2,218

Back-Ended Rollout

Spend by Category ($m)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Developer	-	42	74	112	142	212	272	498	445	143	126	99
Finance	-	42	74	112	142	212	272	498	445	143	126	99
EPC	-	84	148	224	284	423	543	997	890	287	251	199
Advisors	-	42	74	112	142	212	272	498	445	143	126	99
Subcontractors	-	253	439	544	518	886	1,050	1,632	1,220	386	375	264
Battery Manufacturer	-	-	8	5	3	4	2	3	2	3	-	-
Turbine Manufacturer	-	-	-	124	332	382	258	50	-	-	-	-
Solar Panel Manufacturer	-	-	-	-	-	-	201	890	912	235	332	97
Inverter Manufacturer	-	-	-	-	-	-	50	222	228	59	83	24
Conductor Manufacturer	-	42	73	70	31	84	93	99	26	10	10	10
Wind Turbine Manufacturer	-	-	-	-	-	-	171	638	764	296	130	259
Rotor Blades Manufacturer	-	-	-	-	-	-	85	319	382	148	65	130
Electrical Equipment Manufacturer	-	126	221	252	204	380	457	697	496	164	146	120
Concrete / Steel Manufacturer	-	84	147	223	284	423	536	934	853	302	201	239
Cogen / Biogas	-	-	-	-	-	-	-	-	28	55	83	55
Total	-	716	1,257	1,777	2,081	3,217	4,262	7,977	7,134	2,375	2,053	1,695

Appendix 3: Example Interventions to Build Workforce Capacity and Local Participation

PROJECT	INITIATIVE
NorthConnex[51]	NorthConnex has set a target of 5% Indigenous workforce participation and is currently sitting at around 4%. So far almost 300 Aboriginal or Torres Strait Islander workers have worked on the $3 billion project. NorthConnex has engaged local Indigenous businesses to provide services ranging from crane subcontractors to event catering with a total spend of more than $15 million.
Sydney Metro[52]	Infrastructure Skills Legacy Program In 2016, Sydney Metro City and Southwest and the NSW Department of Education formed an agreement to be one of the first demonstration pilots for the Infrastructure Skills Legacy Program (ISLP). The ISLP is a NSW Government initiative to increase and extend the benefits of the government's infrastructure program to build a legacy of skills and jobs in communities across the State. The program funds nationally accredited training programs through Smart and Skilled. To support these programs Sydney Metro created a strategic stakeholder forum called the Skills and Employment Advisory Group (SEAG). Sydney Metro coordinated the forum, bringing together the NSW Government, Federal Government, industry bodies, employers and training bodies. Sydney Metro committed to the following minimum training and diversity targets for the pilot program: • Total Full Time Equivalent (FTE) of 'learning workers', including apprenticeships and traineeships, for the project equivalent to 20 per cent of the total labour force up until the project is 90 per cent complete.

[51] Alister Henskens SC MP. (2018). Indigenous Australians Leading The Way On NorthConnex. Accessed at: https://www.alisterhenskens.com.au/news/indigenous-australians-leading-way-northconnex

[52] Sydney Metro. Workforce development and industry participation. Accessed at: https://www.sydneymetro.info/workforce-development-and-industry-participation

PROJECT	INITIATIVE
	• Double the number of women in non-traditional pathways in the general construction and civil construction sectors. • Annual growth in Aboriginal or Torres Strait Islander people in both trade and non-trade positions in general construction and civil construction consistent with the Government's Aboriginal Participation in Construction Policy. • Eight per cent of the total project workforce aged less than 25 years, reflecting their share of the total workforce. • Strategies to ensure projects employ and train people from the local region. Sydney Metro is currently achieving the following outcomes: • 40% of the workforce is made up of learning workers • 4% of the workforce are Women in non-traditional trades (compared with 1% industry-wide) • 2.5% of the workforce identifies as Aboriginal and/or Torres Strait Islander • 14% of the workforce are under 25 Pre-Employment Program Sydney Metro's pre-employment program (PEP) is a collaborative model providing accredited entry level technical skills and employability training for the long term unemployed and other under-represented groups in the workforce. The program is designed to prepare job ready candidates for entry-level opportunities. Sydney Metro's PEP has contributed to increasing social opportunity and equity for local, long-term unemployed, Aboriginal people as well as getting more women into construction. Industry Curriculum The Sydney Metro Industry Curriculum (SMIC) program aims to increase workforce capability and capacity by developing transferrable skills and competency of individuals across the industry. The approach includes mandatory pre-commencement training for defined occupations and across all levels of leadership and management. Sydney Metro Apprentice Program The Sydney Metro apprenticeship program (SMAP) was developed to meet the demands of Sydney's infrastructure projects. The program aims to improve completion rates as well as the needs of industry to build capacity. The SMAP is delivered through Hunter Valley Training Company/Migas, a group training organisation with assistance from industry appropriate registered training organisations. Sydney Metro works with lead providers to ensure a high level of communication is provided throughout the program.

PROJECT	INITIATIVE
	The program supports contractors to increase the completion rates for apprentices and trainees on their package of works. The program provides contractors with short or long-term placement options based on the length of their package and apprentices with rotation options to continue their apprenticeship while gaining experience on other packages within Sydney Metro projects. The SMAP works in conjunction with the Department of Industry and Smart and Skilled to ensure government subsidised funding and support is available for the program via the ISLP.
Pacific Highway Upgrade – W2B[53]	By mid-2020 with the program at 90% complete, $64 million has been spent with Aboriginal businesses, exceeding the 1.5% government target. Local industry participation was maximised on the NSW North Coast by awarding contracts to 9 local quarries along the alignment, which had an added benefit of reducing time spent in transit on the local road network.
WestConnex[54]	The WestConnex training academy has provided thousands of accredited training courses, with a focus on providing training for Aboriginal and Torres Strait Islander people, women, young people and school leavers, Western Sydney residents and people with disabilities. WestConnex partners have teamed up with Western Sydney TAFE and other registered training organisations to ensure all training is accredited and transferable. More than 80% of the contracts signed on the M4-M5 Link Tunnels project have been with suppliers based in NSW. These include companies in: • temporary works design • traffic management • geotechnical engineering work • precast work Of the more than 7,000 workers and subcontractors involved in the M4-M5 project to date, more than a third are from Western Sydney, highlighting the jobs and opportunities this project is creating for local workers and businesses[55].

[53] Australian Constructors Association. (2020). Pacific Highway Upgrade Woolgoolga to Ballina. Accessed at: https://www.constructors.com.au/wp-content/uploads/2020/11/ACA-IA-Response-Pacific-Highway-W2B.pdf

[54] WestConnex. (2021). WestConnex Facebook Page. Accessed at: https://www.facebook.com/WestConnex/ - Posts on 8 April 2021, 30 May 2021

[55] https://www.westconnex.com.au/media-releases/breakthrough-on-m4-m5-link-tunnels/

PROJECT	INITIATIVE
Project EnergyConnect[56]	The contractor must develop an Aboriginal Participation Plan, which includes: • 2.5% of project spend dedicated to Aboriginal engagement and participation • At least 30% of the minimum spend on contractor's employees (direct and indirect employment and training costs) • Development of a plan for engagement with local Aboriginal groups, employment and training providers to maximise education, training and employment opportunities • Job readiness programs, including mentoring, work experience placements, apprentice and trainee opportunities and capacity building of Aboriginal owned businesses. The contractor must develop a Workforce Development Plan, which includes: • Undertaking training to assist in re-skilling and upskilling their workforce • A minimum of 20 Apprentices or Trainees across the supply chain • Development of programmes for engagement with NSW tertiary education providers including work experience placements (minimum of 10 places) and graduate placements (minimum of 5 places) • The contractor must maximise the use of local sources of supply where they compete (commercially and technically) with imported products.
Gold Coast Light Rail[57]	The project set a target of 82.5% local employment for the wider Gold Coast area, achieving 96% recruitment of project employees from within that area, with over 80% living within the City of Gold Coast electorate. The project also set a stretch target of 78.9% local goods and services procured, at completion the project had significantly exceeded this target achieving 94.50% of goods, services and employment from the local economy generating approximately 6,500 direct and indirect jobs and spending more than $600 million with local businesses.
Canberra Light Rail[58]	70% of the project workforce came from Canberra and the surrounding region. The contractor partnered with UNSW and ADFA to create work experience and employment opportunities for students. 130 local businesses were involved, representing more than 40% of the contracts let by the contractor.

[56] MBB Experience on Project EnergyConnect

[57] McConnell Dowell. Australian Construction Achievement Award 2015 Technical Paper Gold Coast Light Rail. Accessed at: https://acaa.net.au/wp-content/uploads/2020/02/Gold-Coast-Light-Rail.pdf

[58] Canberra Metro. (2021). Canberra Metro Local Industry Participation. Accessed at: https://www.canberra-metro.com.au/local-industry-participation/

PROJECT	INITIATIVE
New Submarine construction[59] [60]	French group, Naval has committed to spend at least 60% of the contract value for Australia's 12 new Attack-class submarines in Australia (total contract value $89 billion). This will result in over 2,000 Australians being employed in Adelaide. There is a requirement in the contract to approach the Australian market in the first instance for the majority of equipment.
Snowy Hydro 2.0[61]	A Snowy 2.0 Business Directory has been established to help Snowy Hydro and the principal contractors understand what technical capabilities, equipment, services, and skills are available from businesses across the region, and to maximise local opportunities.
Victorian Tunnelling Centre[62]	The Victorian Tunnelling Centre (VTC) is located at Holmesglen Institute's Drummond Street campus in Chadstone, where it offers specialist training to workers in the construction and operation of a variety of tunnels including rail, road, and utilities tunnels. Holmesglen Institute is a Victorian TAFE organisation. The facility includes a replica mined tunnel and a replica Tunnel Boring Machine (TBM) tunnel with a full-height entrance, two multi-purpose engineering workrooms and training facilities including tunnel shaft and concrete lining spray simulators, as well as augmented and virtual reality experiences. A cutterhead, a refuge chamber and the only four-motion bridge and gantry crane located in a TAFE also form part of the facility. The Victorian Tunnelling Centre will train thousands of workers as part of the Victorian Government's planned rail projects. It is envisaged that the facility will continue to be used going forward training workers from other jurisdictions in Australia and Southeast Asia (there are only 4 similar facilities operating worldwide). Holmesglen proposed the facility to government, with support from major contractors delivering tunnel projects in Melbourne. The Metro Tunnel Project's Tunnels and Stations contractor CYP Design & Construction (a joint venture comprising John Holland,

[59] Naval News. (2021). Australia and Naval Group Ink Agreement On Attack-Class Submarine Program. Accessed at: https://www.navalnews.com/naval-news/2021/03/australia-and-naval-group-ink-agreement-on-attack-class-submarine-program/

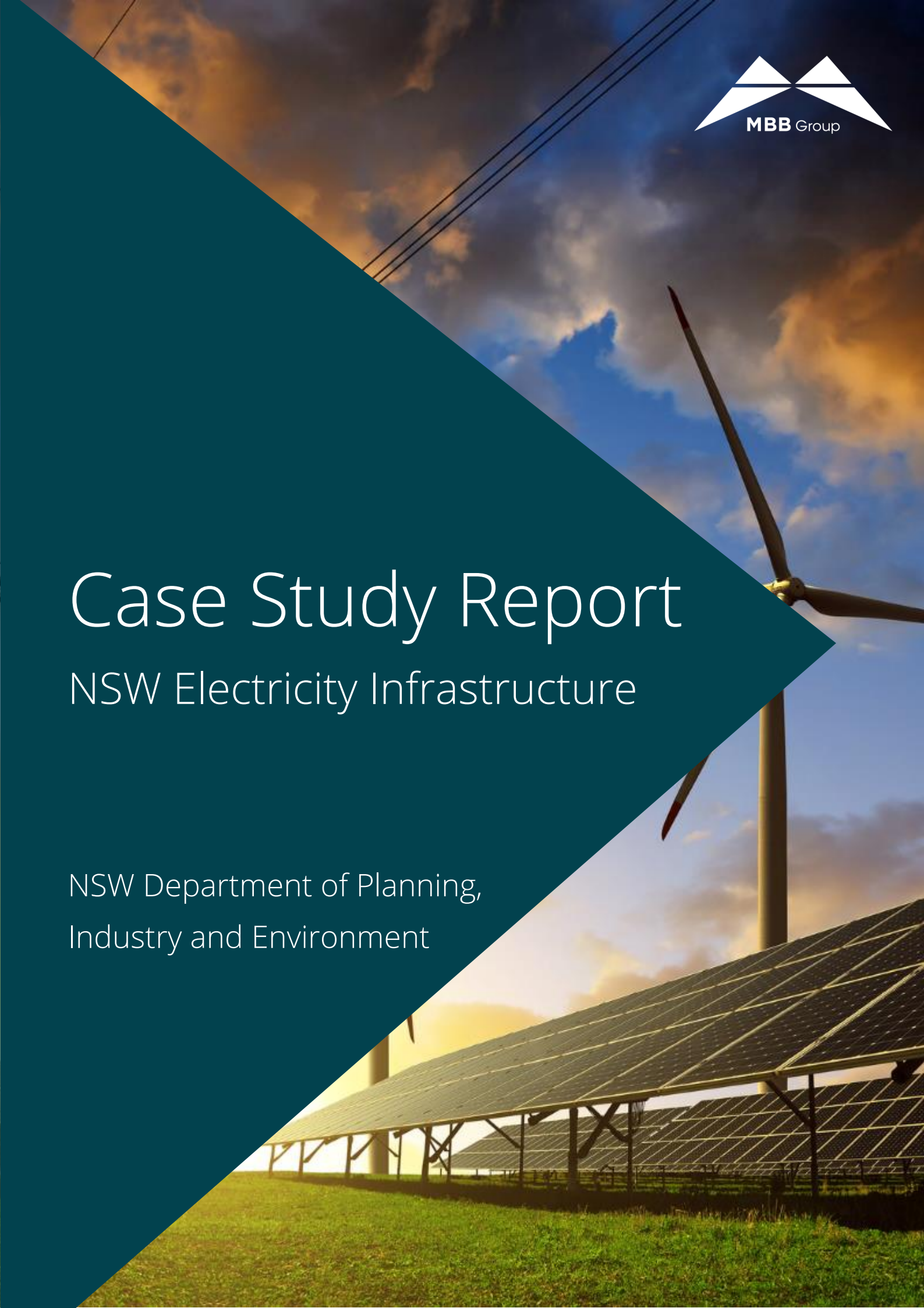
[60] Defence News. (2021). Naval Group trumpets its Australian industry focus in submarine deal. Accessed at: https://www.defensenews.com/global/europe/2021/03/30/naval-group-trumpets-its-australian-industry-focus-in-submarine-deal/

[61] https://www.snowyhydro.com.au/wp-content/uploads/2019/05/SH1387_SQUARE-BOOKLET_Snowy-2-Project-Update_MAY-2019_v6_lowres_spread.pdf

[62] https://holmesglen.edu.au/Industry/Victorian-Tunnelling-Centre/, and discussions with Holmesglen Institute

PROJECT	INITIATIVE
	Lendlease and Bouygues Construction) had oversight of the design and build of the facility, with Holmesglen managing the on-site construction and day-to-day operation. The development of the VTC was driven by the requirements of the Major Project Skills Guarantee (MPSG), which applies to Victorian construction projects with a total project value of $20 million or more and requires the use of Victorian apprentices, trainees or cadets for at least 10 per cent of the total estimated labour hours.

Appendix 4: Case Study Report



MBB Group

Case Study Report

NSW Electricity Infrastructure

NSW Department of Planning,
Industry and Environment

Disclaimer

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1 Introduction

1.1. Background

The NSW Government's Electricity Infrastructure Roadmap November 2020 (Roadmap) is a coordinated framework to deliver a sustainable and flexible electricity system for NSW.

This coordinated approach to transmission, generation, storage and firming will deliver approximately 12 gigawatts of new transmission capacity and attract up to $32 billion in private investment in regional energy infrastructure investment by 2030. This pipeline of electricity infrastructure will support over 6,300 construction and 2,800 ongoing jobs in NSW.

The NSW Department of Planning, Industry and Environment (DPIE) wishes to undertake a domestic and international scan for relevant and recent case studies in local content initiatives to identify lessons learnt and best practices in other jurisdictions.

MBB Group has been appointed by DPIE to assist with understanding the issues and opportunities, including the development of this report.

1.2. Objectives

This report seeks to identify projects and jurisdictions with similar challenges and objectives to NSW. It aims to distil key lessons to support the Renewable Energy Sector Board in identifying job creation and local manufacturing opportunities in the roll out of the Roadmap.

Using publicly available sources, MBB Group has researched recent case studies and reports to summarise key learnings and make recommendations to achieve the Roadmap objectives in a sustainable way.

This report makes four key recommendations to provide certainty and encourage additional entrants to the NSW market and maximise opportunities for local content creation.

1.3. Report Sections

1. INTRODUCTION	Provides background to MBB's engagement to develop this report
2. CASE STUDIES	Summarises the case studies detailed in Section 5 and provides context as to why they were selected
3. RECOMMENDATIONS	Highlights four key recommendations from the case studies analysed
4. INFORMATION SOURCES	References the publicly available sources used in the preparation of this report
5. APPENDICES	Individual Case Studies

2 Case Studies

2.1. International

2.1.1. Canada - Indigenous Engagement / Ontario's Long Term Infrastructure Plan

Canada and Australia are directly comparable jurisdictions. Both are British colonies, federal states with constitutional monarchies. Canada has 10 provinces compared to Australia's 7 states / territories with both populations spread across vast continents. Canada and Australia's trade are also similar with a comparable split between manufacturing, mining and agriculture.

Canada is recognised for best practice in Indigenous capacity building and is one of the first jurisdictions to legislate community benefits in infrastructure planning.

Two case studies have been included in this report: Indigenous Engagement and Ontario's Long Term Infrastructure Plan.

Federal government policy is aimed at encouraging greater local content whereas provincial requirements specifically promote Indigenous communities' involvement and the use of Impact and Benefit Agreements (IBA). IBAs are privately negotiated, legally enforceable agreements that establish formal relationships between Indigenous communities and industry proponents. With a few exceptions, governments are not directly involved in the development or negotiation of these bilateral arrangements. Broadly, IBAs serve two primary purposes. Firstly, they seek to address the potentially adverse effects of project development activities on Indigenous communities, with a view to providing some compensation for these activities. Secondly, IBAs help to ensure that Indigenous communities acquire benefits from project activities occurring on their traditional territories such as job creation, training and procurement opportunities between private parties.

Ontario is highlighted as the first Canadian jurisdiction to pass legislation to enable consideration of community benefits in infrastructure planning and investment. The foundation legislation[1] defined three initiatives to unlock greater economic, social and environmental value:

1. Workforce Development

   Initiatives that provide employment and training opportunities (including apprenticeships) to members of traditionally disadvantaged communities, underrepresented workers and local residents.

2. Social Procurement

   The purchase of goods and services from local businesses or social enterprises.

[1] Infrastructure for Jobs and Prosperity Act 2015

3. Supplementary Benefit Initiatives

   Initiatives that make a neighbourhood a better place to live, work and play — benefits that a community affected by a major infrastructure project asks for such as a physical public asset (e.g. child care facility or park) and/or getting an improved use from an existing public assets (e.g. design features to reduce noise pollution or traffic congestion during and after construction.

2.1.2. Denmark - Local Value Chain

Denmark is a world leader in wind technology and has over 30 years' legacy of government policy in the renewable energy sector.

Denmark's electricity grid is comparable to the National Electricity Market as it exchanges electricity via a network of transmission cables connected to Norway, Sweden and Germany.

The case of Denmark highlights how government and the private sector have developed a unique value chain: universities are a key stakeholder in the supply chain as they support extensive site selection, technology development and supply a constant inflow of local, highly-skilled specialist labour. Further, Government supports collaboration between complementary existing industries to expand local value creation.

Denmark has also pioneered community co-ownership / co-investment models that directly benefit local residents, address land use conflicts/tensions and build social capital. Innovative ownership models of wind turbines define 'local' with a specific metric e.g. within 4.5 km of the project.

2.1.3. OECD – Developing Robust Pipelines for Low Carbon Infrastructure Report

The Organisation for Economic Co-operation & Development prepared a report[2] analysing international case studies for governments to consider when planning robust project pipelines. It considers what constitutes good practice in infrastructure planning and finds that government actions need to be strengthened to meet long-term climate mitigation objectives.

This recent research takes a close look at comparable jurisdictions' pipelines of low carbon infrastructure and suggests that '…they can only be as robust as the investment-ready and bankable projects that constitute them, as effective as institutions that deliver them, and as ambitious as the objectives to which they are linked.'[3]

[2] https://www.oecd.org/publications/developing-robust-project-pipelines-for-low-carbon-infrastructure-9789264307827-en.htm

[3] https://www.oecd.org/publications/developing-robust-project-pipelines-for-low-carbon-infrastructure-9789264307827-en.htm Page 1

Key practices that are identified include:

1. Provide a single, coordinated voice for government action on pipeline development, including the alignment of policies and institutions.
2. Provide "one-stop shops" for the private sector to provide information, direction and co-ordination.
3. Gather and use data and indicators to track and measure progress against policy objectives, assess risks and highlight or identify opportunities.
4. Standardise infrastructure planning processes, including contract arrangements and legal agreements, to streamline efficient project development.

2.1.4. IRENA – Leveraging Local Capacity in Wind

Forty-nine wind industry stakeholders were interviewed by the International Renewable Energy Agency in the development of this case study report[4]. It has been chosen as a useful snapshot in support of analysing the separate supply segments of a value chain to inform policy making and assesses the job creation opportunities by development phase.

2.2. Domestic

2.2.1. Bank West Stadium – A NSW Collaborative

Bank West Stadium is a 30,000-capacity world-class sports arena located in Parramatta, NSW. Developed by Infrastructure NSW with construction partner Lendlease, this project was chosen as a recent case study because it used a design for manufacture approach to meet local steel content requirements.

The structure containing 4,600 tonnes of locally supplied steel was designed and specified to ensure local steel mills could competitively produce steel which would ultimately be sent to a large group of existing suppliers and fabricators within a 10km radius of the stadium

2.2.2. Snowy Hydro 2.0 - Concrete Segment Factory

The Polo Flats Concrete Segment Factory5 is an example of a NSW energy infrastructure project's decision to invest in local manufacturing as an alternative to an overseas supplier. It is live case study of a DPIE approved project, utilising a predominantly local workforce for construction of major infrastructure.

[4] https://www.irena.org/publications/2017/Jun/Renewable-Energy-Benefits-Leveraging-Local-Capacity-for-Solar-PV

[5] https://www.snowyhydro.com.au/news/poloflat-announcement/

2.2.3. EnergyConnect - Development Phase Local Content Targets

EnergyConnect is larger and more complex than anything the NSW Transmission Network Service Provider has delivered in the last 20 years and is also significantly greater in scale, cost and complexity than any single project previously considered by the Australian Energy Regulator.

Early in the development phase, developer TransGrid set clear Aboriginal Participation targets and defined 'local' to exceed the minimum participation targets set by government in its EPC contract. EnergyConnect conducted market sounding and best practice procurement6 to ensure that the ambitious targets could be achieved.

2.2.4. BHP - Local Buying Program

BHP's C-Res program has been developed over 10 years. It is a relevant example of a centralised approach to building and developing a local supplier base using an online tool.

2.2.5. ACT Renewable Energy Program

The ACT Government achieved 100% renewable energy generation by 2020 within five years of setting a policy target. This domestic case study demonstrates how an open market competitive reverse auction process, in combination with incentives for households and businesses to take-up rooftop solar systems, can help achieve an ambitious renewable energy target in a short period of time.

The percentage target and reverse auction process were effective signals to market that the ACT Government was serious about attracting investment.

2.2.6. Victorian Government - Local Content Requirements

Victoria has the longest standing industry participation legislation in Australia. The *Local Jobs First Act 2003* provides that the Minister may determine a requirement to use a specified amount of Australian steel products for strategic projects.

In the lead up to the 2018 election, Premier Daniel Andrews pledged a guaranteed 92% of Australian steel for construction of the West Gate Tunnel. However, due to local supply constraints the contractor ultimately imported 33,000 tonnes or 17% of project steel from China. This case study highlights the need for Government to consult with industry to develop achievable local content requirements.

[6] Major infrastructure best practice in Australia refers to the process of implementing a delivery strategy via a two-phase tender: EOI and RFT, followed by an evaluation phase conducted according to a robust governance framework. EnergyConnect tender involved three bidders and the evaluation panel included an Observer Panel with membership form the NSW Government, PIAC and AEMO.

3 Recent Project Data

Table 1 summarises the Indigenous Participation targets for recent major infrastructure projects in Australia. Government policy is a minimum 1.5% spend on Indigenous organisations and so most projects target this minimum requirement however, there are examples where a higher benchmark has been set for contractors to meet. In regional areas it would be expected that a higher target could be achieved due to the higher proportion of the community identifying as Aboriginal or Torres Strait Islander as shown by Project EnergyConnect, which traverses much of southwest NSW.

Table 1- Infrastructure Indigenous Participation Targets

PROJECT	CONTRACTOR	MIN. INDIGENOUS PARTICIPATION % OF TOTAL SPEND
WestConnex	Samsung/CPB	3%[7]
NorthConnex	Bouygues	1.5%
Metro City & Southwest	John Holland/CPB	1.5%
Gold Coast Light Rail	John Holland	None specified
Canberra Light Rail	John Holland/CPB	1.5%
Parramatta Light Rail	CPB	1.5%
Pacific Highway Upgrade	CPB / Laing O'Rourke	1.5%
EnergyConnect	Elecnor / Clough	2.5%

[7] Targets provided by Aboriginal Employment Strategy, the Indigenous Workforce enabler who provided resources to WestConnex

4 Key Recommendations

1. **Local content needs to be informed by existing capability and capacity, developed in consultation with industry and monitored for compliance.**

   As there is no one-size-fits-all solution, Government should develop local content requirements in collaboration with the key stakeholders (industry, local suppliers and Aboriginal communities) to ensure mandatory targets are achievable.

   Government should also collaborate with industry to develop separate definitions for 'local'

   - Suppliers – goods and services
   - Labour participation – workforce.

   Ultimately, the government should also monitor compliance to ensure benefits accrue to NSW and create sustainable stimulus.

2. **Local content is a shared responsibility and should be promoted early in the project lifecycle.**

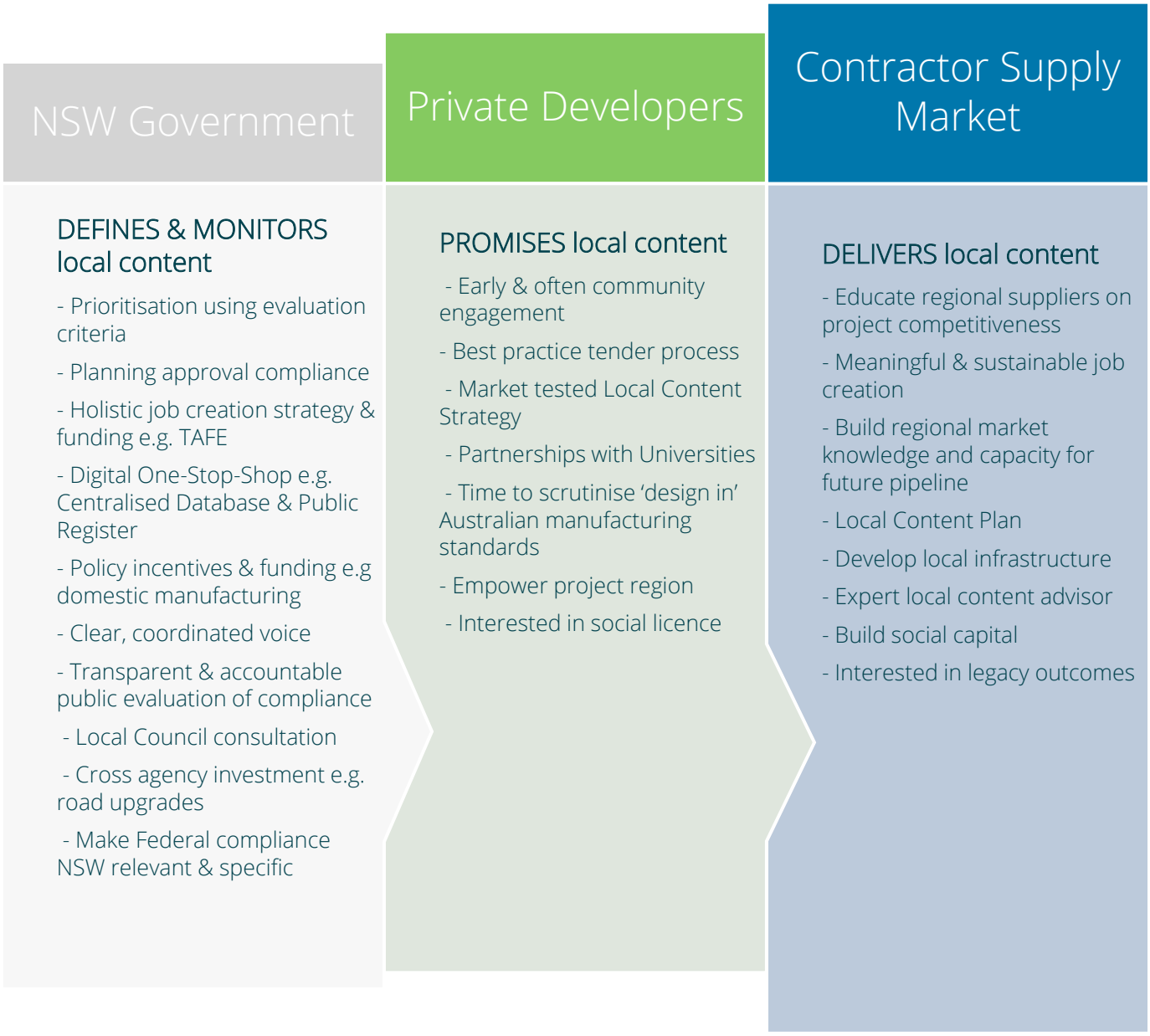
   Government can directly influence the private sector by making local content a function of planning approvals and selection criteria for procurement. A recent case study in NSW[8] highlights the importance of collaboration between Government and the private sector early during design phase to ensure local content requirements were met.

   Developers need time to identify potential innovations and contractors need time to 'go shopping' in regional markets, understand existing local capacity and engage with local communities to build capacity.

   Government levers can ensure policy objectives are translated into tender processes and move through the supply chain to private sector developers as proponents who then contract with the market to deliver local content as shown in Figure 1.

[8] Bank West Stadium

Figure 1: Local Content Share Responsibility



3. Local content requirements need support from Government.

Local content requirements should support sustainable 'jobs' creation and create meaningful employment outcomes that are transferrable after a project is handed over.

Policy makers must consider that regional projects face greater challenges than just training. Contractors and employers face barriers to attraction, recruitment, retention and re-mobilisation of labour in regional areas due to differences in the local workforce to metropolitan areas.

A common example of policy misalignment is when Indigenous participation is pushed down the supply chain to subcontractors who have the shortest scopes of work. In most cases, it is easier for subcontractors to use short-term labour hire contracts than meet the long-term career and development aspirations of the local Indigenous workforce.

Government support is required in the form of a holistic job creation strategy & funding for skills development such as TAFE accreditations.

4. A centralised and coordinated approach will provide the private sector with investment certainty and realise efficiencies.

Local content is a shared responsibility and government can play an important role in centralising regional business directories, training tools and collaboration hubs.

A REZ platform could be developed (for example with Central-West Orana as a pilot) as a 'one-stop-shop'. Data could then be used to undertake future analysis of regional labour market capacity and project evaluation for continuous improvements and promote private sector accountability.

Rather than a segmented approach from private developers, government could centralise Local Council consultation and identify regional road and communication upgrades that may be required to facilitate a program of infrastructure projects. This is particularly the case where large pieces of equipment are being laid down or installed such as wind turbines at a port or transformers that exceed the capacity of rural bridges.

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6 Appendices – Case Studies

BHP Local Buying Program

C-Res

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Program Snapshot

Organisation
BHP
BMA
C-RES

Inception
QLD in 2012

Program
Online directory for small businesses

Summary

C-Res stands for community resourcing and is a local buying program used by BHP Program Administrators to manage all transaction activities.

The online directory was established in 2012 to support QLD operations and has now expanded into NSW, SA and WA.

Since 2012, C-Res has exceeded $500 million in spending and the program has worked with over 1,450 local businesses, on over 36,000 work packages.

Findings

- BHP converted the cost and time of managing small order, low value procurement items to underwrite a social program that also generates social dividends
- BHP developed a partnership with strategic advisors to develop a cost neutral organisation
- The central online directory is used by suppliers (mostly small business owners) to competitively bid for opportunities through a streamlined onboarding, procurement and payment processes
- The program was expanded to provide ongoing support, engagement and mentoring of registered local suppliers
- C-Res has been successful in sourcing and expanding the local supplier network to provide goods and services in alignment with BHP operational requirements
- Large private company partnered with local content and engagement experts to develop and implement a coordinated solution

Key Lessons

1. A centralised directory is an efficient online tool for regional businesses to access a large pipeline of opportunities and could be replicated for each REZ through a single online platform.
2. A supplier directory has evolved into an education tool and business collaboration hub. A NSW renewable energy 'one-stop-shop' could cater for supplier registrations, local council requests, certifications, developer participation plan registry and employment opportunities.

Canada: Indigenous Engagement

Local Content Policies in Mining

Policy Snapshot

Location
Canada

Population
38.4 million

Sector
Mining
5% of GDP

Employment
Around 380,000 across the value chain and 150 communities

Federal Policy
Minerals and Mining Policy
Investment Canada Act
Business Corporations Act

Policy Summary

Canada is one of the largest mining countries in the world. Its approach to support creation of local opportunities has evolved over 150 years and is heavily focused on supporting Indigenous peoples.

Federal government policy is aimed at encouraging greater local content in mining and provincial requirements specifically promote Indigenous communities' involvement in mining projects.

Regulatory Frameworks

- To obtain the Minister's approval for a transaction, an investor often needs to negotiate a set of undertakings such as maintain certain employment levels and make a certain level of charitable contributions
- Federal Acts stipulate a minimum % of Canadian directors and employment opportunities in Canada belong first to Canadian citizens
- Minerals & Mining Policy recognises the 'desire of Indigenous peoples to be involved with decision – making, and to participate in the economic benefits derived…'
- Government policy supports a partnership approach to Indigenous content such as the Aboriginal Participation in Mining Sub-Committee and leaves prescriptive outcomes to the private sector agreements
- Impact and Benefit Agreements (IBAs) are private contracts primarily focused on benefits relating to local jobs, training and procurement opportunities. The federal government maintains a register of these agreements . For example:

  The Raglan Agreement

  A First Nation's benchmark agreement signed with Inuit communities to facilitate equitable and meaningful participation as well as a commitment to support training to maximise the number of jobs that can be filled by Inuits.
- The Northwest Territories ask mining organisations to put in place follow-up programs in the form of socio-economic agreements and oversees their implementation.

Key Lessons

1. A numeric target for Indigenous participation % is more successful than a 'best efforts' requirement.
2. Areas for improvement include clarifying consultation protocols and building on existing training programs for Indigenous communities to enhance their skill levels.
3. Research recommends IBAs should be transparent to promote accountability from the private sector.
4. Early engagement with Indigenous communities can identify capability and knowledge development such as training and certification requirements of local labour and suppliers.
5. IBA benefits need to be distributed equally across the community and avoid the majority remaining 'in the hands of those in charge' as a result of community governance structures or local class divisions.
6. Targets need to be realistic and informed by community consultation.
7. Private sector agreements reflect government policy but also need to be publicly registered and evaluated.
8. Government initiatives should consider opportunities for communities that last beyond project completion.

- There is also an emphasis on monitoring commitments and outcomes with organisations typically required to report annually or bi-annually on employment and recruitment issues by group and spend by group
- Policy requires continuous improvement and government conducts evaluation research and critical studies
- Federal and provincial governments facilitate the development of suppliers' capacity clusters

Denmark: Local Value Creation

Developing a Unique Value Chain

Case Study Snapshot

Location
Denmark

Population
5.8 million

Installed Wind Capacity
1,703 MW in 2020

Policy
Renewable Energy Act
(First government renewable energy plan 1976)

World Record
In 2019, 47% electricity was produced by wind power

Findings

- The Danish Energy Agency manages procedures for permit schemes for wind projects - most projects have been developed in response to public tenders
- Legislation requires new infrastructure to be 20% co-financed by private, local investors with a stable return on investment over the lifetime of the wind farm
- Danish citizens living within 5 km of a development are eligible to buy shares and then remaining shares are offered to permanent residents
- Danish automotive and aerospace industries have been leveraged to build its wind industry. New system supplier solutions strengthen supply chains – turbine manufacturers are supported by collaborative programmes and suppliers are increasingly joining forces in collaborative networks
- The Technical University of Denmark specialises in wind modelling and creates mesoscale wind maps for use in resource assessment
- Danish universities have programs offering wind power courses and specialist skills are embedded in to curricula
- DanSteel started producing steel plates in 2012 with its own harbor and the most advanced steel making equipment. Despite having to import raw materials (iron and steel), it is a leading supplier of steel for wind energy in Northern Europe
- Government tax incentives drive local cooperatives to invest in community-owned wind turbines. For example, a community energy generation best practice case study:

The Hvide Sande Wind Farm

On a beach next to the small port town is a wind farm owned by the local community foundation. Profits from the turbines are spent on collective projects and decided on by a board of local residents such as the modernisation the local harbour.

Key Lessons

1. Community co-ownership models directly benefit local residents, address land use conflicts/tensions and build social capital.
2. Universities are a key stakeholder in the supply chain as they support extensive site selection, technology development and supply a constant inflow of local, highly-skilled specialist labour.
3. Innovative local and inclusive ownership models of wind turbines define 'local' with a specific metric e.g. within 4.5 km of the project.
4. Government support of collaboration between complementary existing industries expands local value creation.

Photo credit: "Wind energy 135/366" by Blue Square Thing is licensed under CC BY-NC-SA 2.0

- Denmark has developed efficient, state-of-the-art heavy duty harbours for manufacturing, assembly inspection and shipping of large wind turbine components
- Strong networks have been established between manufacturers and research facilities and Danish universities

Energy Connect

Major Transmission Infrastructure: Development Phase

Photo credit: "Transmission Lines" by Chris Hunkeler is licensed under CC BY-SA 2.0

Project Snapshot

Developer
TransGrid

Contractor
SecureEnergy JV:
Elecnor, Spain
Clough, Australia

Contract Value
$1.5 billion
Est. 50% spend in Australia

Construction Jobs
+1,000

Construction
Duration 2.5 years
Completion early 2024

Construction Statistics

- 330 kV interconnector
- 700 km length
- 1 million cubic metres earthworks
- 1.8 billion litres water
- 110,000 cubic metres concrete
- 31,500 tonnes tower steel
- 9 million metres of Mango conductor
- 1,507 towers
- 3 million labour hours
- 6 work camps
- 420 km access tracks

Project Details

Project EnergyConnect (PEC) is TransGrid's 700 km portion of a high voltage electricity interconnector between the power grids of SA and NSW. PEC aims to reduce the cost of providing secure and reliable electricity while facilitating the longer-term transition of the energy sector across the National Electricity Market (NEM) to low emission energy sources.

PEC is significantly larger and more complex than anything TransGrid has delivered in the last 20 years and is also significantly greater in scale, cost and complexity than any single project previously considered by the Australian Energy Regulator. The Federal and NSW Governments support PEC as part of the broader suite of measures to enhance the NEM as coal-fired power stations are progressively decommissioned starting with Liddell in 2023.

Local Content

- TransGrid's Australian Industry Participation Plan (AIP) obligations included ICN gateway supplier registration and opportunities advertised via project website
- As a private sector developer, TransGrid used contract mechanisms to ensure minimum Aboriginal employment outcomes – 2.5% of total spend and at least 30% of this target on direct employees
- Contractor's Local Industry Participation Plan defines local sources of supply as Australian entities prioritised from: firstly, LGAs and Local Aboriginal Land Council Areas including Language Group Areas intersected by the route; secondly, other areas within NSW; and then interstate
- TransGrid requires the contractor to achieve minimum 60/100 Infrastructure Sustainability Council of Australia certification which positively scores local goods
- Stakeholder engagement was a key focus in workshops with tenderers to help the contractor understand needs of local councils early in procurement phase

Key Lessons

1. Early engagement with Traditional Owner groups builds trust and identifies training & certification gaps.
2. Best practice procurement empowers suppliers to understand local labour capacity, community feedback and local council requirements before delivery phase.
3. Clear definition of 'local' and 'content' gives suppliers the best chance to deliver.
4. Initiatives to promote local job creation and community benefits are voluntarily adopted in private contracts to build social capital.
5. Private sector uses tender evaluation to prioritise suppliers who can deliver community benefits with certainty.

Photo credit: "Site visit for Project EnergyConnect" by MBB Group

Government of Ontario, Canada

Long Term Infrastructure Plan

Policy Snapshot

Location
Ontario, Canada

Infrastructure Investment
$190 billion over 13 years

Employment
125,000 jobs on average, each year

Legislation
Jobs and Prosperity Act, 2015

Population
14 million

Policy Summary

Ontario is Canada's most populous province with nearly 40% of the country's population.

In 2014, the Government of Ontario announced an unprecedented level of infrastructure investment and was the first Canadian jurisdiction to pass legislation to enable consideration of community benefits in infrastructure planning and investment.

The foundation legislation defined three initiatives to unlock greater economic, social and environmental value:

1. Workforce Development
2. Social Procurement
3. Supplementary Benefit Initiatives.

Government Plan

The Long Term Infrastructure Plan 2017 recommended identifying community benefit pilot projects to lay strong, evidence-based groundwork as a first step.

Highly Skilled Workforce Strategy

The Strategy aims to attract newcomers to help employers meet their labour market needs. Youth programming is a core component and in 2016, the government announced $190 million over three years to 'Career Kick-Start' to help young people access hands-on learning and job-readiness resources.

A modernised apprenticeship system prioritises increased participation and completion rates for under-represented groups including Indigenous learners. The Eglinton Crosstown LRT (a government infrastructure project) introduced an Apprenticeship Declaration as a procurement requirement.

Ontario Immigrant Nominee Program

Ontario piloted an Express Entry online system to facilitate permanent residence opportunities for foreign nationals who are already in Canada. The new system was developed to help government strategically manage intake, increase labour market responsiveness and better respond to regional labour market needs and provides data to undertake future analysis of regional capacity of the labour market.

Key Lessons

1. Job creation is more than just training – a holistic strategy is needed. Regional employment needs government support in attraction, assessment, engagement, industrial relations, performance upskilling retention and mobilisation of labour.
2. Compliance is the most effective mechanism for governments to positively impact local content in the private sector. Governments should use prioritisation assessment criteria and conditions of approvals to maximise community benefits.
3. A centralised online database is an effective way to connect private employers with suppliers and labour resources.
4. Communities desire autonomy in the process of defining, articulating and negotiating the benefits that they wish to see through an infrastructure project. Accordingly, governments can provide necessary resources to groups and networks where they do exist and creating an enabling environment where they do not.
5. Local content is a shared responsibility. Governments should adopt a set of core principles to guide the process of community engagement and overcome tensions and challenges. Governments need to engage early and often and keep broader public interest at the heart of all activities such as:
    - Accountability, Transparency and Trust
    - Uncover and Leverage Community Network
    - Foster Community Capacity

Community Collaboration

The Plan recognises that objectives cannot be achieved without '...working closely and collaboratively with federal and municipal counterparts, private-sector and community partners and First Nations communities'. The government recognises that linear and non-linear assets impact communities differently.

IRENA Leveraging Local Capacity

Renewable Energy: Onshore Wind

Research Snapshot

Organisation
International Renewable Energy Agency

Report
Renewable Energy Benefits
Leveraging Local Capacity IRENA 2017

Sector
Onshore Wind Energy

Source Data
49 wind industry stakeholders

Summary

The report assesses the types of jobs created along the value chain of wind energy deployment and recommends how to maximise local value creation.

It analyses the potential for local value creation in developing domestic wind energy infrastructure by different segments of the value chain.

Findings

- In 2030, cumulative global estimates for wind:
  - 2,565 GW installed capacity
  - 3.5 million jobs
  - USD $6,290 billion of investment
- Mostly due to economies of scale, total installed costs of wind energy installations in 2025 is expected to decline by 12% compared to 2015
- Total project cost can be broken into:
  - Civil works 8-17% depending on the foundation type
  - Connection costs 8-11% including transformers and substations
  - Project planning costs 9-11%
  - Wind turbines 64-84% including installation
- Turbine costs fluctuate with the price of steel and copper
- For a typical 50 MW wind farm with 2 MW turbines, 22,836 tonnes of concrete and 5,860 tonnes of steel are needed
- A turbine manufacturer's decision to establish an onshore facility or limit the business to assembly of imported parts depends on the:
  1. Existence of government policies to incentivise local content
  2. Availability of raw materials and existence of related industries
  3. High costs of transporting bulky equipment.
- Technological development has enabled longer blades and taller towers creating transportation challenges and construction bottlenecks (harbour congestion, laydown at ports, road capacity, width of bridges etc.)
- It takes 875 person days to transport components of a 50 MW wind farm 500 kilometres by truck
- It takes around 12-20 months to install and connect a 50 MW wind farm
- Over 75% of labour resource inputs are construction workers and technical personnel

Recommendations

1. Policy makers need to analyse the labour, materials and equipment requirements of each segment in the value chain as a first step before pursuing domestic investment.
2. Education and training policies need to meet labour requirements and skills of the wind energy sector (see The Case for Denmark).
3. Government interventions are needed to contribute to domestic competitiveness. Industrial upgrade and supplier development programmes, development of industrial clusters, investment schemes and promotion of joint ventures are needed to strengthen industrial capability and promote R&D.

Developing Robust Project Pipelines for Low-Carbon Infrastructure

OECD

Photo credit: "Light rail in Sydney" by Bernard Spragg is marked with CC0 1.0

Research Snapshot

Organisation
Organisation for Economic Co-operation & Development

Report
Developing Robust Project Pipelines for Low-Carbon Infrastructure (OECD, 2018)

Scope
New low-carbon infrastructure projects across a range of technologies

Source Data
International case studies, literature review and industry experts

Summary

The OECD report focuses on the actions needed to develop robust, low-carbon project pipelines.

It considers what constitutes good practice in infrastructure planning and finds that government actions need to be strengthened to meet long-term climate mitigation objectives.

Findings

- Not one-size-fits all for governments to promote and develop robust infrastructure pipelines
- Governments are best placed to shape the development of their pipeline; utilising a suite of available tools and levers such as employing risk mitigants like public guarantees or setting policy incentives on specific technologies
- Six factors underly effective government efforts to develop robust pipelines:

1. Leadership - champion a clear vision of future investment needs and direction
2. Transparency - to help private sector investment decision makers justify commitments or develop exit strategies
3. Prioritisation - expediting or optimising strategically valuable projects and shepherding them through development processes
4. Project support - aim to overcome investment barriers, unlock important challenging sectors or technologies, and mobilise actors
5. Eligibility criteria - deploy systematic processes for identifying eligible projects and set strategic conditions to translate policy objectives into project pipelines
6. Dynamic adaptability - make efforts to ensure pipelines are informed by long-term strategic planning of investment pathways to avoid expensive path dependency or lock-in

Key Recommendations

1. Provide a single, co-ordinated voice for government action on pipeline development, including the alignment of policies and institutions.
2. Provide “one-stop shops” for the private sector to provide information, direction and co-ordination.
3. Gather and use data and indicators to track and measure progress against policy objectives, assess risks and highlight or identify opportunities.
4. Standardise infrastructure planning processes, including contract arrangements and legal agreements, to streamline efficient project development.

Photo credit: "Snowy Hydro" by Halans is licensed under CC BY-NC-SA 2.0

Snowy Hydro 2.0

Polo Flats Concrete Segment Factory

Project Snapshot

Location
Cooma, NSW Australia

Client
Snowy Hydro Limited

Contractor
Future Generation JV:
Salini, Italy
Clough, Australia
Lane Construction, USA

Construction
Completed 2020
Duration 6 months

Contract Value
$55 million

Construction Jobs
30

Operating Jobs
Employ 125 over four years

Project Details

The tunnels for Snowy 2.0 will be mostly excavated using tunnel boring machines and lined using precast concrete tunnel segments. These segments will be constructed at the Polo Flats Precast Concrete Factory located on an industrial area located to the east of Cooma, NSW.

Construction of the new segment factory includes a covered area for the manufacture of the tunnel segmental linings, uncovered storage areas for raw material and segments, vehicle parking areas and associated offices and workshops.

Primary inputs for the proposed segment factory include aggregate, sand, cement and rebar steel.

Primary outputs include the precast tunnel segmental linings which will be transported to the construction sites of Snowy 2.0 within the Kosciusko National Park.

Approximately 130,500 segments will be manufactured and transported over a 3.5-year operational period to line over 27 kilometres of new tunnel. At the completion of Snowy Hydro 2.0, the factory will be de commissioned.

Local Jobs & Manufacturing

- Civil works subcontractor partnered with an Indigenous owned local business to attract a predominantly local workforce: 6 local Aboriginal workers were employed for 3 months
- Local content obligations contained in the project's Australian Industry Participation Plan were passed to the Contractor:
    - Local businesses encouraged to register via ICN Gateway website
    - Project job and supply opportunities advertised on project website
- Aggregate, sand and cement are sourced within NSW
- Partnership with Monaro High School to pilot school-based trade training e.g. Certificate III Civil Construction

Key Lessons

1. Client utilised its own land to invest in a new factory and avoid importing segments from overseas (shipped from Malaysia via port of Eden then trucked to site)
2. Contractor approached local businesses and schools early to ensure local jobs promised during engagement converted to actual construction jobs
3. Timing of planning approvals for the micro factory aligned with outputs required for construction program
4. Potential factory site in close proximity to tunnel construction and onshore manufacture opportunity using local content identified early in the development phase

Victorian Government

Local Steel Pledge

Pledge Snapshot

Government Pledge
2018 Victorian Election
The Hon Daniel Andrew

Legislation
Local Jobs First Act 2003

Summary

The Victorian Government introduced legislation in 2003 to provide opportunities for local businesses and workers to supply into government projects. It is the longest standing industry participation legislation in Australia.

Section 7B of the Act provides that the Minister may determine matters relating to strategic projects including a requirement to maximise the use of steel products produced by local industry or a requirement to use a specified amount of steel products produced by local industry.

Leveraging the announcement of the West Gate Tunnel project in 2017, Premier Daniel Andrew guaranteed that 92% of the steel used on local projects would be local steel in the lead up to the 2018 Victorian Election.

In 2019, the West Gate Tunnel Contractor announced it would import 33,000 tonnes or 17% of project steel from China.

Findings

The combination of an oversupply in steel manufactured overseas and lack of consultation with local manufacturers and fabricators, has seen an increased amount of imported steel used in Australian projects. Without advance consultation, the local supply chain was unable to ramp up production and participate in the project on a competitive basis.

This outcome conflicts with local content policy objectives.

The implications of the mandatory use of local steel manufacturers has been felt within the construction industry, having had an impact on cost, health and safety and deliverability of key infrastructure projects.

Photo credit: "Precision Oxycut steel cutting" by MBB Group

Key Lessons

1. Government mandated minimum local content supply can lead to project issues and negative community sentiment. Government needs to consider how it can engage alternative supply options at an early stage to allow the supply chain to position itself to participate on a competitive basis.
2. Key risks exist around a focus on major production facilities. Opportunities for smaller producers to increase their market share of production may be useful to help mitigate some of these project risks and in smoothing the supply chain to better deliver project commitments. This also aids to involve local communities as active participants in major infrastructure delivery.

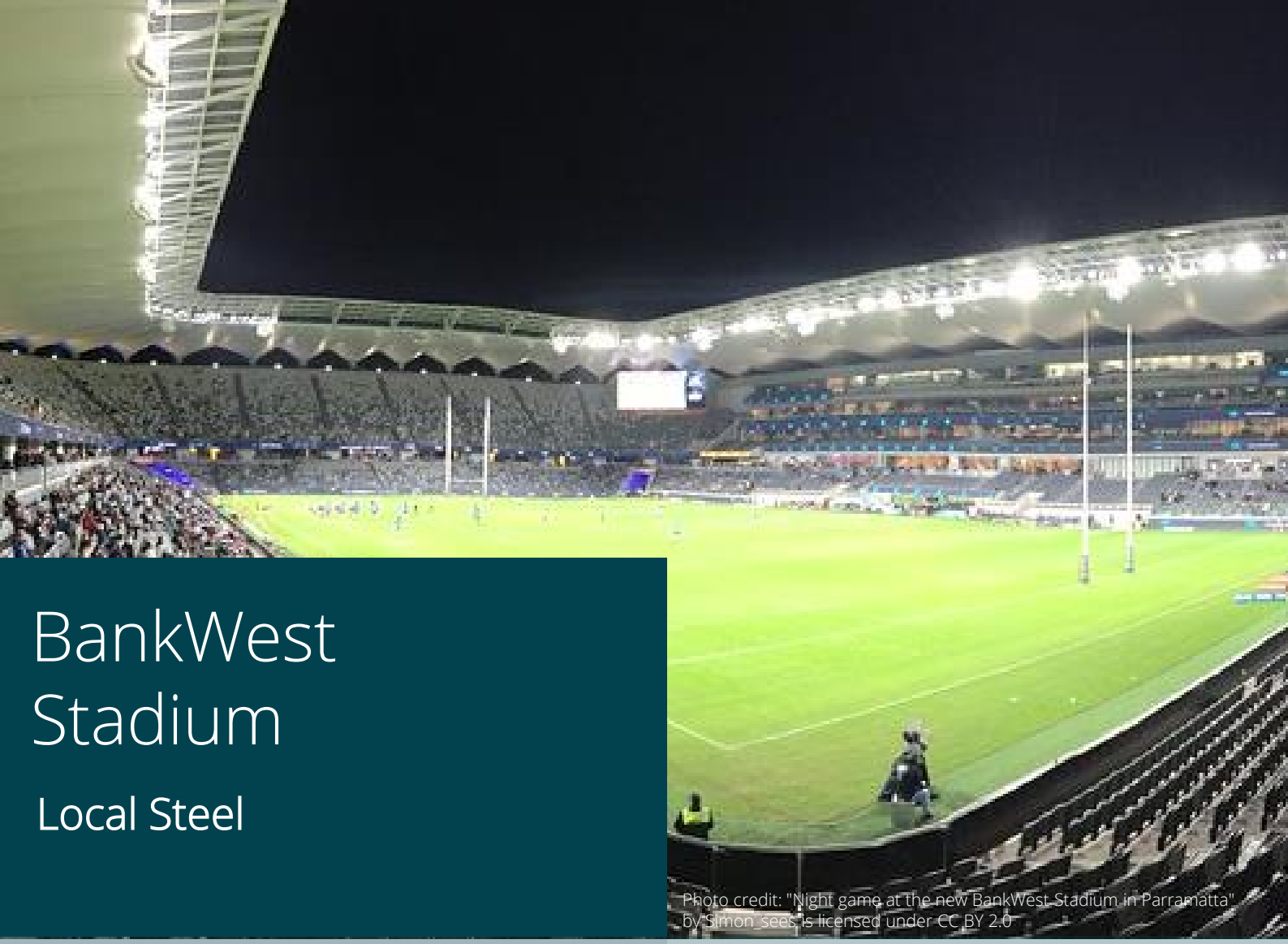

Photo credit: "Night game at the new BankWest Stadium in Parramatta" by Simon_sees is licensed under CC BY 2.0

BankWest Stadium

Local Steel

A NSW Collaboration

Location
Parramatta, NSW Australia

Funded by
NSW Government

Design & Construction Partner
Lendlease

Budget
$360 million

Volume of Australian Steel
4,600 tonnes

Job Creation
1,200 jobs construction jobs
600-900 operational jobs

Construction
January 2017
April 2019

Summary

Bankwest Stadium was delivered by Infrastructure NSW as part of Government's $1.6 billion strategy to improve sporting infrastructure across NSW.

The 30,000 capacity stadium is made from 4,600 tonnes of Australian steel, supplied by Southern Steel Supplies in Milperra NSW with a significant amount manufactured by BlueScope. The exposed local steel was fabricated and painted by several local Western Sydney businesses and the bolted connection design reduced overall welding resulting in construction time savings.

Steel assemblies were designed to be transported via a standard truck and assembled on the stadium pitch before being craned into place. The 28,000 square metre roof is supported by 2,600 tonnes of Australian steel and designed to be disassembled and reused in the future.

BankWest stadium was the first building in Australia to achieve an LEED certification (most widely used green building rating system in the world, developed by the U.S. Green Building Council) and was the national winner of the Australian Steel Institute's Steel Excellence Award: Buildings–Large Projects category in 2020.

Findings

- The design for manufacture approach:
    - Resulted in steel trusses broken down into stick members so local SME fabricators could efficiently handle them
    - Provided local employment, training and up-skilling opportunities through the award of contracts to Western Sydney businesses and the Parramatta Skills Exchange Program
    - Was of sufficient scale to give confidence to the Western Sydney steel supply chain to invest in new equipment and expand capability
- The structure was designed and specified to ensure local steel mills could competitively produce steel which would ultimately be sent to a large group of existing suppliers and fabricators within a 10km radius of the stadium

Key Lessons

1. Critical success of mandatory local steel content depends on a design for manufacture approach. The client, design team, consultants and supply chain must collaborate and innovate early in the design phase.
2. Government local content requirements can leave a legacy in the local community, build capacity in a regional workforce and achieve green certification.
3. The local steel supply chain can manufacture goods competitively if given the opportunity to influence design in areas such as assembly, Australian safety standards and component dimension specifications.

Photo credit: "Afternoon shadows, Bullen Range, Australian Capital Territory" by sharp_pics is licensed under CC BY-SA 2.0

ACT Government

Renewable Energy Program

Program Snapshot

Location
Australian Capital Territory

Local Economic Benefits
~$400 million

Job Creation
+1,000 construction jobs

Reverse Auctioned Capacity
841 Megawatts

Rooftop Solar Installed
100 Megawatts

Targets Achieved
100% renewable energy by 2020

Summary

In 2016, the ACT Government legislated a target of sourcing 100% renewable electricity by 2020. It successfully achieved this target by:

- Reverse auctions for large-scale renewable energy projects
- Small-medium scale rooftop solar incentives and energy storage.

Reverse Auction Programs

ACT was the first jurisdiction in Australia to use reverse auctions, successfully securing 841MW of renewable energy supply from 11 distinct wind and solar farms from ACT and neighbouring states. Generators were awarded agreements via a series of reverse auctions held between 2012 to 2020.

A competitive market process invited proponents to offer renewable energy to ACT at minimal cost to consumers and provide the greatest economic benefits to the state. Proposals were evaluated on 65% financial assessment, 20% delivery risk, 7.5% local community engagement and 7.5% ACT industry engagement. Successful proposals were awarded a Grant of FiT Entitlement and placed in a contract for difference (CFD) arrangement .

A CFD arrangement guarantees a more certain revenue for generators and also helps shield ACT consumers from high electricity prices. The solar and wind farm projects delivered under ACT's reverse auction process have delivered some of Australia's cheapest electricity to consumers.

Rooftop Solar Incentives

ACT led a feed-in-tariff scheme between 2009 and 2011 to incentivise take-up of rooftop solar systems for households and businesses. The result of this scheme was a rapid increase in installations to around 10,000 systems.

Feed-in-tariff schemes are now electricity retailer led and has continued to provide value, with over 20,000 systems installed since 2011.

Key Lessons

1. The percentage target and reverse auction process were effective signals to market that the ACT Government was serious about attracting investment. Clear signals build confidence in the private sector for investment certainty.
2. A CFD arrangement helped market achieve financial close and provided revenue certainty. The private sector needs Government policy that supports project viability: certainty of outcome, cost and financial close.
3. Government should develop policy with the 'long game' in mind to support sustainable growth of an industry beyond a project horizon. This case study demonstrates Government's role as an innovator, in the way it attracts private investment with an appropriate allocation of risk, to support an emerging industry. As the market reaches a critical scale, open market competition and innovation will drive cost efficiencies which will ultimately benefit electricity consumers.
4. ACT has demonstrated how a reverse auction process can help achieve an ambitious renewable energy target in a short period of time.

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Appendix 5: Market Engagement Report

MBB Group

Supply Chain Market Engagement Report

NSW Electricity Infrastructure

NSW Department of Planning, Industry and Environment

Disclaimer

This report was prepared by MBB in good faith exercising all due care and attention, but no representation or warranty, express or implied, is made as to the relevance, accuracy, completeness or fitness for purpose of this document in respect of any particular user's circumstances. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect of, their situation. The views expressed within are not necessarily the views of the Department of Planning, Industry and Environment (DPIE) and may not represent DPIE policy.

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Appendices

Appendix 1 Market Engagement Plan

Appendix 2 Questionnaires

Appendix 3 DPIE Probity Protocol

1. Introduction

1.1. Purpose

The NSW Government's *Electricity Infrastructure Roadmap* November 2020 (**Roadmap**) is a coordinated framework to deliver a sustainable and flexible electricity system for NSW.

This coordinated approach to transmission, generation, storage and firming will deliver approximately 12 gigawatts of new renewable generation and attract up to $32 billion in private investment in regional energy infrastructure by 2030. This pipeline of electricity infrastructure will support over 6,300 construction and 2,800 ongoing jobs in NSW.

The NSW Department of Planning, Industry and Environment (**DPIE**) wishes to investigate the supply chain that would participate in the Roadmap, particularly:

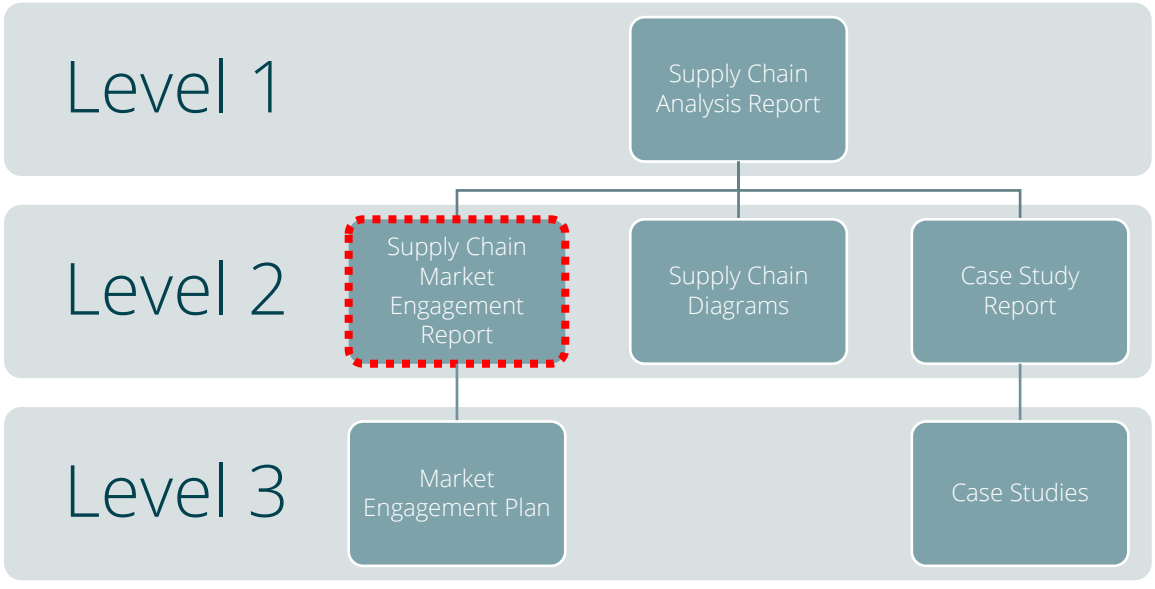
What elements of the existing regulatory / legislative arrangements currently discourage investment or new entrants?

How to attract new entrants to the market?

How to develop and maintain a sustainable pipeline and supplier base that ensures that NSW Government delivers the NSW Electricity Infrastructure Roadmap?

MBB Group (**MBB**) was appointed by DPIE to assist with understanding these issues via market engagement, including development of this *Market Engagement Report*. A diagram of MBB's full scope of service deliverables is summarised in Figure 1.

Figure 1- MBB Energy Advisory Document Hierarchy



1.2. Objectives

The objective of this market engagement process is to consult with a cross section of the electricity infrastructure industry to identify constraints, risks and opportunities faced by the supplier market in the rollout of the Roadmap.

The purpose of this report is to summarise supplier market feedback to enable NSW Government to:

- Understand the supply chain constraints, risks and opportunities to deliver the Roadmap
- Identify opportunities for increased local participation in the Roadmap
- Understand potential cost implications of increased local content
- Support the Consumer Trustee to schedule the rollout of the Roadmap to reflect industry's delivery capability
- Support the Infrastructure Planner develop a coordinated and centralised approach.

MBB's supply chain recommendations can be found in the *Supply Chain Analysis Report*, the overarching document commissioned by DPIE as part of this engagement.

2 Consultation

2.1. Supply Chain Engagement - Interviews

MBB's *Market Engagement Plan* found at Appendix 1 identified organisations from a cross section of the renewable energy sector and proposed a short list of interview candidates, which was approved by DPIE. MBB interviewed participants using a version of the Questionnaire found at Appendix 2 between 2 June 2021 and 18 June 2021. The opportunity to be interviewed was on a voluntary basis and as such not all organisations participated.

The list of organisations interviewed[1] is shown in Table 1.

Table 1- Interview List

INTERVIEW	ORGANISATION	CATEGORY DESCRIPTION
1	Australian Steel Institute	Steel Industry Peak Body
2	BlueScope	Manufacturer – Flat Steel Products
3	Canadian Solar	Developer – Solar PV
4	Clean Energy Council	Renewable Energy Industry Peak Body
5	Clough	EPC Contractor
6	CPB Contractors	EPC Contractor
7	Elecnor	EPC Contractor
8	Fluence	Manufacturer – Battery Components
9	Fortescue Future Industries	Developer – Hydrogen Generation
10	GE	Manufacturer – Pumped Hydro
11	Neoen	Developer – Solar PV / Wind / Battery
12	Nexans Olex	Manufacturer – Cable

[1] One participant, GE submitted a written response.

INTERVIEW	ORGANISATION	CATEGORY DESCRIPTION
13	Origin Energy	Developer – Battery / Pumped Hydro
14	Oven Mountain Pumped Hydro	Developer – Pumped Hydro
15	Precision Oxycut	Manufacturer – Steel Fabricator
16	Tesla	Manufacturer – Battery
17	TransGrid	Developer – Transmission
18	Vestas	Developer – Wind
19	Wilson Transformer Company	Manufacturer – Transformers

The three organisations listed in Table 2 did not respond to MBB's requests for interview:

Table 2- No Response

NO RESPONSE	ORGANISATION	CATEGORY DESCRIPTION
1	Beon	EPC Contractor
2	Fotowatio Renewable Ventures	Developer – Solar PV / Battery
3	Trina	Manufacturer – Solar PV

One organisation declined to be interviewed and is shown in Table 3:

Table 3- Declined

DECLINED	ORGANISATION	CATEGORY DESCRIPTION
1	SunPower	Manufacturer – Solar PV

2.2. Methodology – MBB's Consultation Process

The engagement process undertaken is outlined below:

1. DPIE emailed each organisation introducing MBB Group and the upcoming consultation.
2. MBB contacted each organisation to determine willingness to participate and requested a suitable time for an interview.
3. MBB sent a meeting invite (with DPIE copied) and provided the Questionnaire and DPIE Probity Protocol in advance of the allotted time.
4. MBB conducted the interview via Microsoft Teams or in person[2]. Each interview was attended by at least one MBB interviewer and a record keeper.
5. MBB completed an interview summary for each interview.
6. MBB sent a 'Thank You' email to each participant.

2.3. Probity

The DPIE Probity Protocol attached at Appendix 3 was provided to every participant prior to their interview. The Probity Protocol included the following parameters:

- No electronic recording of the interview is permitted
- Information exchanged with DPIE will not in any way constitute an endorsement, approval, instruction or evaluation of a concept or methodology
- Participation in the interviews is voluntary, non-assessable and confidential.

MBB gave a short PowerPoint presentation Appendix 4 at the start of each interview and asked the participant to confirm that they had read the DPIE Probity Protocol before commencing the Questionnaire.

DPIE engaged OCM as probity advisor. OCM attendance at interviews was coordinated by DPIE. OCM attended most interviews but not all.

It is important to note that MBB encouraged interview participants to respond honestly and rely on the DPIE Probity Protocol. At least four participants sought further clarification on this point, whether the Renewable Energy Sector Board could identify individual responses as originating from an organisation. In reply, MBB gave assurances that findings would be collated and represented anonymously.

MBB provided detailed interview notes to DPIE separately and marked them as '*Confidential – Not for Distribution',* interview notes are not attached to this report.

[2] One participant, GE submitted a written response.

3 Summary of Findings

3.1. NSW Electricity Roadmap

The Roadmap and commitment shown by the Minster for Energy & Environment have been very well received across the renewable energy sector supply chain however pipeline certainty and visibility is key to building confidence.

"The Roadmap is the best plan I've encountered in my 18 years in the renewable energy sector" DEVELOPER

Key observations are summarised below:

- Developers agreed that the scale of the Roadmap ($32 billion and 12 GW by 2030) is attractive to investors but unrealistic mandatory local content requirements can squeeze already low profit margins and hinder market appetite to be involved

  "A local mandatory percentage of zero projects, is zero local benefit." DEVELOPER

  "The NSW Government needs to be careful in prescribing a local content requirement which advantages a monopoly who can then increase prices." DEVELOPER

  "Most projects are only marginally viable and so small changes to costs can stop a project from proceeding." DEVELOPER

- Participants agree the Roadmap allows enough time to build capacity and capability in the supply chain with appropriate support from Government

  "Government could support local innovation such as funding facilities for manufacturing driven steel H piles." DEVELOPER

  "We would like to see details of the location and scheduling of generation and transmission developments in advance." CONTRACTOR

  "NSW Government could facilitate a showcase where steel manufacturers/fabricators can present their innovations to show their capabilities and invite practical collaboration with developers to enable investment into the domestic supply chain. Without early engagement from developers, there is no time for Australian companies to innovate an improved solution." MANUFACTURER

  "Companies should be provided transparency or early heads-up on the staging of tenders for the REZ, as well as the time horizons that sit behind different REZ segments so that they can plan accordingly." MANUFACTURER

  "The supply chain would require "real intent" by the State and Federal government to build a local supply chain." MANUFACTURER

- Manufacturers are keen to have the opportunity to play a larger role in the renewable energy sector supply chain, however they have expressed uncertainty that they will be provided the opportunity.

"Often international developers come with a pre-determined supply chain, even if they are forced to give local suppliers tendering opportunities. A local Australian supplier made innovations to offer their product in the renewables industry, however the international players showed no interest or intention in actually awarding the contract" MANUFACTURER

"Prices offered locally are way too expensive to be feasible. We do not even consider obtaining quotes from domestic suppliers as we already assume that the product would be more expensive. In many instances there isn't an Australian supplier, or they are unable to supply the volume required." CONTRACTOR

3.2. Supply Chain Constraints & Opportunities

3.2.1. Supply of Goods or Materials

Preference for international goods is price driven (either perceived or real) however there are opportunities for local, competitive solutions.

"There is roughly a 30% higher price for domestic steel – quite significant." MANUFACTURER

Key observations are summarised below:

- Participants are currently experiencing significant supply chain constraints resulting from the global pandemic: higher shipping costs, low shipping availability (high competition), delays in port and rising global demand however, most Participants expect pre COVID-19, more favourable conditions to return

  "COVID has caused a lot of disruption at ports / getting containers into the country, and international companies shutting down where they typically source materials from. Some of the raw ingredients are from overseas which was impacted by COVID." MANUFACTURER

  "Everything is a supply chain issue! Steel prices have gone up nearly 50%, copper 30% and aluminium 40%. Shipping containers have tripled in price. Either COVID driven or a global commodity price driven." CONTRACTOR

- Solar Developers and Contractors are concerned with the Chinese monopoly on Photo Voltaic (PV) module production. Projects are cost sensitive due to the low margins. Therefore, 'supply sourcing' drives the ability to meet the low-cost solution sought by the owners and operators of solar operating in a monopoly held market

  "In the past 12 months, we have twice experienced Chinese suppliers not honouring contracts. PV modules make up about 50% of the contract value of a solar project – therefore when Chinese suppliers amend the price of their modules, there are significant cost impacts on our fixed price Australian project." CONTRACTOR

  "Solar panel production is currently centralised in Xin Jiang. This supply chain risk can be managed by bringing a portion of production to Australia, particularly solar panel assembly." DEVELOPER

- All Participants expressed a concern around rising commodity prices and rising costs of transportation

  "Commodity prices are not only going up, but their forecast prices are also uncertain. We are unable to lock in prices to forecast for projects. Transportation prices are also going up (shipping and containers getting delayed and more expensive), providing uncertainty to the delivery times and pricing." CONTRACTOR

- Table 4 summarises Participant feedback on the existing capability of the domestic supply chain and future opportunities for the renewable energy sector

  "In terms of domestic manufacturing opportunities, AC cables are largely supplied by Asia and Europe. As the need for transmission infrastructure grows, it makes more sense for production of AC cables to occur in Australia." DEVELOPER

  "We believe that if government did specify local content, one opportunity would be the piles for the solar panel units." DEVELOPER

  "We know at least four fabricators that have said if they have the funding or investment, they would be able to start production on wind towers as soon as possible." MANUFACTURER

Table 4 - Summary of Local Supply Chain Opportunities from Industry

Current Local Supply	Opportunity for Development	Not Feasible
SOLAR GENERATION		
Civil & Earthworks Concrete Reinforced Steel – Foundations Large Hold Down Bolts	Steel Tracker (fabrication of tubes & backing frames) Steel Foundation Pile Low Voltage Cabling	Photovoltaic Module
WIND GENERATION		
Civil & Earthworks Concrete Reinforced Steel – Foundations Low voltage cabling Anchor Cages	Wind Towers[3]	Wind Turbine Gearbox Blades

[3] MBB note that wind towers are currently manufactured in Victoria however Participants are concerned about the capacity to meet future demand

Current Local Supply	Opportunity for Development	Not Feasible
Large Hold Down Bolts Wind Turbine Assembly		
PUMPED HYDRO		
Civil & Earthworks Concrete Reinforced Steel – Foundations Aggregates Transformers Large Hold Down Bolts	Inverter Skids Steel Pipes	Turbines Generators Inverters
BATTERIES		
Civil & Earthworks Concrete Reinforced Steel – Foundations Transformers	Inverter Skids	Battery Cell Module Inverters
ENERGY NETWORK		
Transformers Custom Screw Pilings	Lattice Towers Guyed Towers Monopoles Low Voltage Cabling	High Voltage Cabling Inverters

- Developers believe automation is key to developing a cost competitive local supply chain for manufacturing but currently there is a lack of skills

  "The only way to bring manufacturing facilities back to Australia would be to fully automate the manufacturing process. That way domestic suppliers can compete globally – remove cost of labour." DEVELOPER

- A local Manufacturer states the high cost of energy in Australia makes domestic manufacturing uncompetitive. In other words, the underlying costs of production as a baseline affect the competitiveness of Australian manufacture versus overseas manufacture

  "We are a large energy user. The cost of electricity is far less to run our factory in China." MANUFACTURER

- The local steel supply chain is already exploring capacity and capability building using existing facilities to manufacture wind tower components

  "The large facility is available and has virtually no constraints on what can be fabricated" MANUFACTURER

  "With $20 million for plant, we could start a wind tower facility within 12 months" MANUFACTURER

3.2.2. Supply of Labour

Availability of general construction labour is not seen as an issue however, Australia currently has a lack of skilled labour specific to renewable energy development (for example electrical network engineers, boilermakers, linesmen, electricians). Significant support will be needed from Government to meet any future mandatory local content targets.

"We need to support and facilitate training to improve skills. Throughout Australia apprenticeship programs have closed due to cost pressures and lack of numbers to keep them open. There is a worry Australia won't have the technical skills. For example, there is a lot of investment into data scientists and other related professions, but they do not have the skills for power transformer work. Hopefully as COVID passes these industries will open to training." MANUFACTURER

Key observations are summarised below:

- Participants across the supply chain agree that specialist skilled labour will need to be sourced from overseas

  "There is a very limited skilled workforce for windfarm projects. It is difficult to train a dedicated skilled workforce – renewable energy is typically very stop and start – not very consistent work." CONTRACTOR

  "We have a massive shortage of linesmen". DEVELOPER

- Contractors and Developers expressed a willingness to use a local workforce but are concerned about the existing capacity and capability in regional NSW

  "We will always try to go local first. It also tends to be the best economic outcome, but resourcing is left to the EPC contractor. The people are often contracted with other projects. For local resourcing it's very hard to meet targets as it depends on how many local resources there are. If the growth in renewables grows as quickly as set out in the Roadmap, NSW will have no other option but to bring resources in from out of state." DEVELOPER

- Participants claim jobseekers want job security, but construction jobs are often misaligned with career opportunities, and they need assurances above and beyond the boom and bust to invest in training for a position that is being seen as here today but gone tomorrow

  "The Government likes to talk about 'job creation' but no one talks about 'job disappearance." DEVELOPER

- Developers and Contractors are constrained by the limited availability of large cranes and specialist crane labour. Crane operations and dynamics for the renewable energy sector are different to other industries due to the need for frequent and constant mobilisation and

demobilisation as a function of productivity. Large cranes perform the core erection activities of the entire project from site to site which need skilled crews to efficiently perform assembly and disassembly activities. The maximum size of a generator that can be installed is dependent on the cranes size available

"There have been instances where private equity companies have bought up some of the reliable crane companies. There are two Australian crane contractors on the market that are promising." DEVELOPER

- Developers and Contractors state the renewable energy sector cannot compete with wages offered by the mining sector

  "If a mine opened up down the road, we'd lose out every time." CONTRACTOR

- The local steel supply chain is experiencing a skills shortage

  "The local steel supply chain lacks critical skills. Steelwork labour is concentrated in Wollongong and Newcastle. There is a shortage of boilermakers and welders due to unpopularity of the occupation with the younger generation. This is not specific to steelworks but rather the whole skills industry. There Is lack of investment in vocational programs" MANUFACTURER

  "Labour skills for fabricators would need to be "tweaked" for wind tower production" DEVELOPER

- Participants advocate for Government support in the areas of targeted apprenticeship and traineeship programs to develop young people for the renewable energy sector

  "There is great opportunity in developing a renewable energy apprenticeship to give young labourers experience in the different renewable energy technologies as well as different aspects of constructing and operating a renewable energy development. This could be nationally recognised so young people could work throughout Australia." DEVELOPER

- One Developer suggested Government support to increase the size of the renewable energy sector workforce

  "It would be more impactful to support skills development with a view to reducing the cost of site activities. For instance, this could take the form of paid training and wage support for thermal generation employees to move across into the renewable energy sector. This would provide a viable jobs-transition pathway for negatively impacted employees and communities, while also helping reduce the installation costs of projects." MANUFACTURER

- Participants agree that a free, centralised Government labour resources network is necessary to meet future mandatory local content targets in NSW

  "Tenderers should have visibility to a register of local suppliers along with their capability AND capacity" MANUFACTURER

  "ICN is a useful centralised database but disincentivised if ICN introduced a fee for service" DEVELOPER

  "A centralised pool of potential apprentices could be available for EPC contractors or proponents to select from" DEVELOPER

- Developers are in favour of both Government and private sector partnerships and collaborations with universities in the areas of innovation and emerging technologies

  "There is no global workforce that works with hydrogen – government should look to invest in academics on how to work with electrochemical engineers and hydrogen in general." DEVELOPER

  "Government should invest in training and education to encourage innovation with young people and bring them into companies to help innovate new products" DEVELOPER

  "We invest in university research as part of contributing to the local economy and appreciate that fostering local content on projects is a social dividend" DEVELOPER

3.2.3. Site Access

Construction of the Roadmap will require many thousands of large vehicle movements across regional NSW, impacting local communities along the route.

"Hauling on public roads causes a massive disruption to local and regional roads. When transporting large components such as wind blades, it can stop traffic in a regional town for hours. It is not feasible to do this with many thousands of blades." DEVELOPER

Key observations are summarised below:

- Participants are concerned about the vehicle activity from multiple construction projects within NSW, both renewable energy sector and transport infrastructure- adverse traffic conditions could accumulate and delay projects

  "Transportation constraints would differ by REZ. We recommend that an overall Road Transport Study be completed to assess potential bottlenecks of the traffic network. The Road Transport Study should be performed in partnership between government, developers and manufacturers – the developers and manufacturers would provide the knowledge of turning radius restrictions for large components." DEVELOPER

- Developers and Contractors commented that the road infrastructure in regional NSW may be unsuitable for transporting heavy loads and unsuitable for maneuvering large components

  "Typically, conditions of approval include 'make good' requirements and/or upgrades to access roads." DEVELOPER

  "There is opportunity for government to partner with local councils to form dedicated routes and bridge strengthening projects to support supply chain logistics." DEVELOPER

- Transportation is a significant time and cost risk for pumped hydro storage and transmission projects, particularly in undisturbed forested or mountainous areas with unsealed roads

  "Armidale – Kempsey Road is not in good shape and not a safe passage. The road would require upgrade works." DEVELOPER

3.3. Regulated Network Risks

The risks, uncertainty and time associated with the regulated electricity network: connection processes, collaboration and congestion management risk, have the potential to negatively impact the development pipeline and can financially derail a renewable energy development. These impacts are so great that they have resulted in reduced confidence from investors and developers in the bankability of renewable energy development in Australia (including NSW).

"The most critical risk by far is the 'AEMO risk'. The time to commission and connect is now taking months not weeks – complex, expensive and uncertain." DEVELOPER

1.8.1 Connection Risk

Key observations are summarised below:

- Participants consider the uncertainty and delays around generator connection approvals from the Australian Energy Market Operator (AEMO) as the greatest risk faced by renewable energy projects - this known in the industry as "connection risk". AEMO has been working with the Australian Energy Market Commission to better define the framework governing connection assets in recent times however, the effect of these proposed rule changes, sharing/collaboration mandates and their consultation timelines are of little impact to improving the current connection processes within the timelines set for transition involving the current pipeline
- Developers and Contractors identified significant risks during their connection approvals due to the time taken to determine/verify technical responses and requirements, conduct system studies and from changes in connection rules, standards and requirements, leading to delays in their approvals or requiring multiple iterations of their submissions

  "Transmission projects that require connection to the NEM will take two years longer to accomplish" DEVELOPER

1.8.2 Congestion Risk

Key observations are summarised below:

- Developers state that congestion4 on solar farm projects, and therefore curtailment risk, has had financial implications and reduces investor confidence in the market

[4] Congestion risk occurs when developers build an oversupply of energy systems that exceeds the local transmission network capacity, and therefore resulting in curtailment of the generation systems

- One Developer expressed concern that the upcoming Coordination of Generation and Transmission Investment reform proposed by the Australian Energy Security Board, which was proposed as a solution to congestion risk, would further exacerbate the issues and reduce investor confidence

  "Banks therefore have been more difficult to obtain funding from – it is now difficult for all developers now to secure funding. There is regulatory risk involved with the REZ." DEVELOPER

3.4. Mandatory Local Content

Realistic mandatory requirements are an effective policy lever to maximise local content and provide confidence to domestic suppliers to plan investment.

"We encourage and welcome the NSW Government to stipulate local content. It would result in us investing further and hiring more people." MANUFACTURER

Key observations are summarised below:

- Participants agreed the local content needs to be mandated so that it is implemented throughout the supply chain but also developed in collaboration with the market. Most importantly, a percentage-target approach needs to be based on an assessment of capability and capacity

  "Without mandated local content, there is a lack of enforcement or 'sting in the tail' in local participation plans, and no real incentive for contractors to go local" MANUFACTURER

  "Unless mandated local content is required and enforced, OEMs will not bother going to domestic suppliers." MANUFACTURER

  "Victoria's VRET system is a great local content structure, however the numbers seem to have been 'plucked out of thin air." MANUFACTURER

  "Local content rules would need to be introduced with very close consultation with solution suppliers, developers and stakeholders to understand what is possible or not possible." DEVELOPER

- Manufacturers believe that the Victorian Renewable Energy Target (VRET) was the sole reason domestic suppliers were even considered

  *"Our only job with a [*unnamed developer*] was on the VRET, they do not consider us for any other projects."* MANUFACTURER

- The supply chain needs time to scale up to avoid suboptimal supply and reduced cost competitiveness

  "*Local content would be more effective at lower percentages that are achievable by suppliers to deliver at a cost competitive rate, rather than rapidly ramping up, building inefficient supply chains and losing cost competitiveness in the process."* MANUFACTURER

  "Victoria went too hard on the local content policy on West Gate Tunnel project without any understanding of the industry's current capacity and the effort required to ramp up to meet demand. Contractors are more likely to look to external suppliers rather than making local content work, and we don't blame them." MANUFACTURER

  "Keppel Prince were placed in an unfortunate position where they were singled out as the sole supplier of wind towers due to the VRET. They were overworked and did not have the capacity to keep up with the demand, which led to suboptimal outcomes for those projects. We tried very hard to make the relationship work." DEVELOPER

- Developers and Contractors claim local content costs more and are very sensitive to the tension between local content and profitability

  "The attractiveness of local supply is primarily a cost issue." DEVELOPER

  "We did not even bother obtaining quotes from domestic market because we already assumed it would be too expensive" CONTRACTOR

  "What is the primary goal of the Roadmap, is it to achieve an affordable energy transition, or to develop the domestic industry?" DEVELOPER

  "Everyone wants cheaper electricity, but they also want their infrastructure to be made from Australian components. You won't be able to get both." CONTRACTOR

  "There needs to be care taken with mandating local content – particularly if the local supplier has a monopoly on the market." DEVELOPER

- Manufacturers and Contractors agree that there is a willingness to accept an Australian made premium, but only up to a point

  "Our value proposition comes from working with a local, witnessing the job going through the factory etc. They have a lot of graduates coming through the factories and seeing the job, you cannot get this experience when products have been made overseas. There are also no language or standards barriers having an in-country supply." MANUFACTURER

  "There is great value in being able to work directly with a domestic supplier if things go wrong or something changes" CONTRACTOR

  "A lot of the imported steel requires rework domestically in order to meet project standards (particularly for mining and general construction) – there are even certain companies that specifically target this niche market – the costs that go into needing to rework the steel is often not captured or considered" MANUFACTURER

- Manufacturers urge Government to consider supporting a pilot project to demonstrate the quality and value of local goods

  "Potentially a pilot study / project / prototype would test the domestic steel industry on whether they can deliver on the steel components" MANUFACTURER

  "Healthy competition between Australian fabricators will ensure the grid is built economically, but more importantly, revenues and tax will be generated locally, and spent locally to better the economy." MANUFACTURER

- Developers with experience in delivering infrastructure projects with high Indigenous participation targets agree that early and often, face-to-face engagement is the critical success factor

  "We have a high preference for using the local workforce to empower regional communities and establishing a mix of skills. We have had the best results engaging with the Aboriginal community in-person on the ground and have Aboriginal engagement leads on each team to directly communicate with communities. We don't send an email first; we send in a team to talk to the Community" DEVELOPER

- Participants generally agree that the Roadmap has significant potential to deliver economic and employment outcomes however, the NSW Government's definition of 'local' is critical

  "We already self-impose Indigenous and local labour participation targets and use a tiered system: Tier 1-Within one hour of the project site or LGA, Tier 2- Region specific and Tier 3-State level" DEVELOPER

  "Local participation could be broken into definitions: supply chain contribution, employment, labour hours, training & apprenticeships" DEVELOPER

  "Local participation should consider the balance-of-plant component of projects rather than the total cost. For example, wind turbines make up 80% of cost are imported" CONTRACTOR

  "It is important to understand what to include and exclude as part of local content calculations – carve out components that cannot be feasibly delivered locally (i.e., turbine manufacturing). A local content range in tenders should be a range from reasonable to stretch target" DEVELOPER

- Manufacturers agree the cost of Australian compliance diminishes their competitiveness against imported goods

  "There are challenges and significant costs running large businesses in Australia such as minimum WHS obligations and standards, yet imported products are not judged based on the same applied minimum standards" MANUFACTURER

  "We prohibit ladders in our factory, we use scissor lifts. This is a $50,000 investment compared with a $50 ladder which may be used by our international competitors" MANUFACTURER

- Manufacturers advocate for a local content requirement to include an outcomes-based approach, for example relevant Australian specifications, modern slavery standards, and quality accreditations. This additional requirement could make percentage targets more effective, but Government must then consider resourcing the auditing of local content claims

  "Quality of all components through the supply chain needs to be fit for purpose over the life of the asset, there needs to be greater accountability across the project lifecycle" MANUFACTURER

  "Compliance and audit should also be a consideration of government policy. What is the consequence of not meeting local content requirements?" MANUFACTURER

  "% targets may be met by artificial development outcomes or creative reporting. Overly prescriptive requirements force one of two outcomes: 1) proponent states intention to meet and then the project doesn't meet requirements or 2) proponent states the target is too high and then is disqualified from process" DEVELOPER

  "Contractors will ask engineers to downgrade specifications for their tender to the market to reduce project costs." MANUFACTURER

  "International tenders and players will often exclude Australian supply through their design, not on purpose, as they use components of differing sizes and dimensions" MANUFACTURER

3.5. EPC Contractor Market

- Developers did not consider the local EPC Contractor market to be a significant risk to project outcomes
- Contractors agreed that Developers are constrained by low margins and the opportunities are lumpy

  "In previous years, we would work on fifteen solar farm projects annually – this year we are only working on five projects." CONTRACTOR

- Developers in wind generation take on the EPC contract lead role and subcontract the civil and electrical works

3.6. Planning Approvals

- Most Participants did not consider planning approvals to be a significant project risk
- Developers expressed the importance of obtaining Critical State Significant Infrastructure status to meeting project milestones

4 Acknowledgements

Participants provided the following documents to MBB after the interviews:

Australian Steel Institute (ASI) (2021a). Capabilities of the Australian steel industry to supply major projects in Australia, Australian Steel Institute (NSW), Sydney

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Appendix 1 – Market Engagement Plan

MBB Group

Market Engagement Plan

NSW Electricity Infrastructure

NSW Department of Planning, Industry and Environment

Disclaimer

This report was prepared by MBB in good faith exercising all due care and attention, but no representation or warranty, express or implied, is made as to the relevance, accuracy, completeness or fitness for purpose of this document in respect of any particular user's circumstances. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect of, their situation. The views expressed within are not necessarily the views of the Department of Planning, Industry and Environment (DPIE) and may not represent DPIE policy.

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1 Introduction

1.1. Purpose

The NSW Government's Electricity Infrastructure Roadmap November 2020 (Roadmap) is a coordinated framework to deliver a sustainable and flexible electricity system for NSW.

This coordinated approach to transmission, generation, storage and firming will deliver approximately 12 gigawatts of new generation and attract up to $32 billion in private investment in regional energy infrastructure investment by 2030. This pipeline of electricity infrastructure will support over 6,300 construction and 2,800 ongoing jobs in NSW.

DPIE wishes to investigate the contractor and developer markets that would participate in Renewable Energy Zones, particularly:

- What elements of the existing regulatory / legislative arrangements currently discourage investment or new entrants?
- How to attract new entrants to the market:
  - Who is currently active in Australia (across renewable generation and transmission)?
  - What other sectors do these firms play in?
  - What other firms operate internationally and may be interested in entering Australia?
- How to develop and maintain a sustainable pipeline and supplier base that ensures that NSW Government delivers the NSW Electricity Infrastructure Roadmap.

MBB Group has been appointed by DPIE to assist with understanding these issues via a market sounding, including development of this Market Engagement Plan.

1.2. Objectives

The objective of this market engagement process is to consult with the electricity infrastructure industry to identify barriers and opportunities faced by the market in the roll out of the Roadmap.

MBB Group will collate and assess this market information to enable the NSW Government to:

- Understand the supply chain constrains and risks involved with Delivery of the Roadmap
- Support the Consumer Trustee to schedule ~$32 billion in shovel-ready tenders for regional energy infrastructure by 2030
- Recommend fastest & most sustainable ramp up of delivery to meet requirements for efficient investment
- Support the Infrastructure Planner develop a coordinated and centralised approach.

2 Market Sounding

2.1. Industry Engagement

DPIE provided MBB Group with a list of industry stakeholders from which a long list of interview candidates was chosen. MBB Group the developed a recommended shortlist of interview candidates based on an efficient cross-section of the industry. The recommended interview list is detailed in Table 1.

Table 1- Interview List

INTERVIEW	ORGANISATION	CATEGORY
1	TransGrid	Developer – Transmission
2	Fortescue Metals	Developer – Hydrogen Generation
3	Origin Energy	Developer – Battery / Pumped Hydro
4	CEP Energy	Developer - Battery
5	Neoen Energy	Developer – Solar PV / Wind / Battery
6	Suzlon	Developer – Solar PV / Wind / Battery
7	Oven Mountain Pumped Hydro	Developer – Pumped Hydro
8	Fotowatio Renewable Ventures	Developer – Solar PV / Battery, Contractor
9	Canadian Solar	Developer – Solar PV / Battery, Manufacturer – Solar PV
10	Vestas	Developer – Wind, Manufacturer – Wind
11	Wind Energy Partners	Developer – Wind
12	Goldwind Australia	Developer – Wind
13	CPB Contractors	Contractor – Tier 1
14	Clough	Contractor – Tier 2
15	Sterling & Wilsons	Contractor – Tier 2
16	Elecnor	Contractor – Tier 2

INTERVIEW	ORGANISATION	CATEGORY
17	RES Group	Contractor – Tier 2
18	Tesla	Manufacturer – Battery
19	Fluence	Manufacturer – Battery
20	Bluescope	Manufacturer – Steel
21	ABB	Manufacturer – Electrical Equipment
22	Siemens	Manufacturer – Electrical Equipment / Wind / Hydro
23	SunPower	Manufacturer – Solar PV
24	Trina	Manufacturer – Solar PV
25	GE	Manufacturer – Electrical Equipment / Wind / Hydro
26	Wilson Transformer Company	Manufacturer – Electrical Equipment
27	Energy Networks Association	Industry Association
28	Clean Energy Council	Industry Association
29	Australian Steel Institute	Manufacturer – Steel
30	Local Authorities	Industry Association
31	AEMO	Industry Association

2.2. Methodology

The industry engagement process will be undertaken as follows.

1. Contact the key person and introduce the scope of engagement with aim of securing a suitable time.
2. Provide an information package and the interview questions to the participant in advance.
3. Conduct the interview in person, via Microsoft Teams or as a last resort using written responses.
4. Compile and analyse the information collected to develop the Market Engagement Report
5. The Draft Market Engagement Report will be provided to DPIE for comment.

Participants will be advised of the following parameters:

- This process is not a short-listing process and does not lead to a contract or any other obligations for any parties.
- Participation is voluntary.
- There will not be an offer of payment made to participants for their involvement.
- Participation or non-participation in the industry engagement will not advantage, disadvantage or preclude any appropriately skilled, experienced or qualified entity from participating in later phases of the Project.

2.3. Timing

In accordance with MBB Group's contractual deliverable milestones dates:

- Interviews will be conducted in May 2021
- Interim Market Engagement Report will be provided to DPIE by 28 May 2021
- Final Market Engagement Report will be provided to DPIE by 18 June 2021 in time for the June Renewable Energy Sector Board Meeting.

2.4. Activities for Consultation

MBB Group has requested a letter of introduction from DPIE to provide participants with evidence of the process and its credibility. This letter will also support MBB Group's ability to optimise engagement and participation.

A questionnaire has been prepared for each participant to be completed during a one-hour session. Information will be provided to the participants ahead of the session.

We understand that this industry engagement is not subject to any confidentiality requirements and participants will not need to complete undertakings of this nature.

2.5. Interview Logistics

Interviews will primarily be conducted via MS Teams and managed by MBB Group. DPIE will be given the opportunity to observe / participate at all interviews at its own discretion.

MBB Group will liaise with each participant to schedule convenient times to hold interview sessions.

MBB Group will attempt to interview each participant however, time and logistic constraints may not enable it to do so. Any organisation that is not invited to participate in such meetings, or that is not able to respond to or accept an invitation to participate, will not be prejudiced in any way in respect of future considerations. A schedule of the proposed meetings will be created and shared with DPIE on a regular basis.

Some participants may be asked to submit a written submission in lieu of an interview.

2.6. Follow Up

Following the completion of the Market Engagement Plan, MBB will issue letters of thanks to the participants on behalf of DPIE.

3 Market Engagement Report

DPIE will be informed of any relevant results that are revealed or uncovered throughout the market engagement process.

Following the completion of the market engagement process, MBB Group will compile and distill its findings into a Market Engagement Report along with recommendations. The report will include a comprehensive record of interview activities and participant inputs.

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Appendix 2 – Questionnaires

NSW Electricity Infrastructure Roadmap

Market Engagement Questionnaire (Contractor)

28 May 2021

Name of Participant	Organisation

Background

This Market Engagement questionnaire (**Questionnaire**) seeks views of potential participants (**Participants**) with respect to the supply chain for renewable energy projects under the NSW Electricity Infrastructure Roadmap (**Roadmap**). The Market Engagement is being conducted by MBB Group on behalf of the NSW Department of Planning, Industry and Environment (**DPIE**).

This Questionnaire should be read in conjunction with the introduction email from DPIE, which provides information about the Roadmap and consultation activities.

Feedback from Participants

The responses from Participants will be used to inform future policy and programs by NSW Government. Supplementary questions may be issued to Participants if required.

While this Questionnaire and other Market Engagement documents may discuss the development of Renewable Energy Zones and electricity infrastructure in a context that may suggest that it will proceed, there is no guarantee that this will occur.

Information deficiencies

For the purpose of responding to this Market Engagement, where information deficiencies exist, Participants are invited to state assumptions, where appropriate, about the Roadmap or other circumstances to enable discussion or comment on relevant issues.

All Participants are encouraged to comment in detail on information that will be required in subsequent phases of the development of the Roadmap to enhance the effectiveness of any subsequent procurement process.

Unsolicited issues

While the Questionnaire outlines specific questions to which responses are sought, Participants are also invited to comment on or raise on an unsolicited basis suggestions or other issues that they feel could provide a more effective solution, cost advantages or a better quality outcome.

Responses

Participants are encouraged to respond to all sections relevant to them during the interview.

Post interview, we encourage participants to submit a written response into the tables below if they think of a further response not covered. For clarity, Participants need only complete this form if they wish: by e-mail to REZ.Engagement@mbbgroup.com.au

Specific Questions for Participants

#	Question	What we need to know	How would we use this information	Response
1	Given the information available to you including through this Market Engagement, is your company interested in the opportunity to be involved with the Roadmap and if so the role(s) it would seek?	• Understand the interests of the stakeholder and relevance of the feedback	• Gauge relevance and interest for future consultation	
2	What supply chain issues are you currently experiencing? How do you anticipate these will change in the future? How do these issues impact your project/business?	• The current capacity and capabilities of the supply chain locally and globally. • What are the barriers to ramping up the supply? • Where future issues in the supply chain might arise given trends to increase renewables globally to meet emission reduction targets. E.g. limited supply of copper, semi-conductors or skilled workers • How do these issues impact projects (approvals, cost, time)?	• Identify the gaps and constraints in the current local and global market and possible interventions • Take these issues into account when planning delivery for the Roadmap	
3	What is your perception or knowledge about the capacity of the EPC contractor market to undertake your project(s)? Do you expect challenges in procuring an EPC contractor? Who are your preferred	• The current capacity and capabilities of the EPC contractor market locally and globally • Future constraints in capacity of the EPC market • What are the barriers in the EPC market	• Identify the gaps and constraints in the current market and possible interventions • Take these issues into account when planning delivery for the Roadmap	

#	Question	What we need to know	How would we use this information	Response
	partners?			
4	Which components of your projects are sourced from local suppliers and which are imported? What proportion of your local suppliers are small or medium enterprises (SMEs) and what do they supply? For example: Steelwork, concrete, Control Equipment, Substation Equipment, Cable, PV Modules, Inverters, Turbines, Turbine Blades, Towers, Batteries, Other major elements Note a small or medium enterprise (SME) is a business with fewer than 200 full-time equivalent (FTE) employees.	• Test the findings from literature. What proportion is local. • What proportion of goods purchased locally are from local SMEs (firm with fewer than 200 FTE) and the type of components or services supplied. Note a preference in government procurement to benefit SMEs is permitted under the *Public Works and Procurement Act 1912*.	• Identify current local and SME capacity to supply electricity infrastructure projects	
5	What is preventing you from sourcing more content from within Australia or local SMEs? Are there any parts of the supply chain that could be developed within Australia with appropriate government support?	• If not using local suppliers, why? • What is the biggest pain point(s) for suppliers when it comes to sourcing local content • Which components could be supplied locally?	• Identify where capacity of local supply could be increased and what investments would be required • Determine whether preferencing SMEs could increase use of local suppliers	
8	What is the size and skills make-up of your workforce to deliver	• Does NSW have the local workforce needed to deliver the Roadmap	• Identify current and potential future gaps in the NSW workforce for	

#	Question	What we need to know	How would we use this information	Response
	projects? Is this expected to change going forward?	infrastructure? • Would there be any constraints in the workforce given ramp up in construction in NSW and other states and overseas?	delivery of the Roadmap and where local workforce development is appropriate • Identify potential interventions to increase employment of local workers and indigenous participation	
9	What proportion of your workforce are from other countries or interstate? Do you have an Aboriginal participation target? What would you or NSW need to provide to develop, attract and maintain a NSW based workforce? What factors would discourage you to maintain a workforce in NSW?	• What is needed to attract and keep a NSW workforce to deliver the Roadmap infrastructure e.g. competitive wages, training, housing, good internet and transport	• Identify current practice in employment of local and indigenous workers • Identify potential interventions to increase employment of local workers	
10	If there was a NSW Government requirement to achieve a target local content, what would be the challenges and opportunities? What levels of local content could be achieved economically and what would be the impact on cost?	• How would buying local/employing local workers impact project costs? • Does buying local always increase costs for the project or do savings (on transport, import duties, accommodation for overseas workers, apprentices' wages etc) offset costs? • Is buying local considered when	• Determine what types of requirements to include for procurement processes • How these might be introduced to limit impacts on electricity consumers • Identify measures for increased indigenous participation	

#	Question	What we need to know	How would we use this information	Response
	For example, sourced within NSW or the region, or a minimum requirement for small and medium enterprises, local employment or Aboriginal participation	purchasing or overlooked? • Would increased costs be passed on to customers? Would this impact electricity consumers?		
11	What do you see as key to supporting and encouraging the use of local resources / suppliers / workers?	• What are the key solutions to encouraging local content	• Relative importance of potential interventions	

General Questions for Participants

The following table sets out questions that prompt responses from Participants in relation to any additional issues, risks, concerns or opportunities which you would like to comment on, relating to the rollout of the REZ program or the development of local opportunities on renewable developments. Please copy and paste the section below as many times as required if you wish to raise more than one issue.

#	Question	Response
1	What is the key issue, risk, concern, opportunity which you would like to comment on?	
2	How do you consider the issue can be addressed satisfactorily?	
3	Are there any innovative approaches to resolving the issue of which you are aware?	
4	Please provide any other comments, suggestions, feedback or concerns about any aspect of the supply chain for the Roadmap that you would like to provide.	

NSW Electricity Infrastructure Roadmap

Market Engagement Questionnaire (Developer)

28 May 2021

Name of Participant	Organisation

Background

This Market Engagement questionnaire (**Questionnaire**) seeks views of potential participants (**Participants**) with respect to the supply chain for renewable energy projects under the NSW Electricity Infrastructure Roadmap (**Roadmap**). The Market Engagement is being conducted by MBB Group on behalf of the NSW Department of Planning, Industry and Environment (**DPIE**).

This Questionnaire should be read in conjunction with the introduction email from DPIE, which provides information about the Roadmap and consultation activities.

Feedback from Participants

The responses from Participants will be used to inform future policy and programs by NSW Government. Supplementary questions may be issued to Participants if required.

While this Questionnaire and other Market Engagement documents may discuss the development of Renewable Energy Zones and electricity infrastructure in a context that may suggest that it will proceed, there is no guarantee that this will occur.

Information deficiencies

For the purpose of responding to this Market Engagement, where information deficiencies exist, Participants are invited to state assumptions, where appropriate, about the Roadmap or other circumstances to enable discussion or comment on relevant issues.

All Participants are encouraged to comment in detail on information that will be required in subsequent phases of the development of the Roadmap to enhance the effectiveness of any subsequent procurement process.

Unsolicited issues

While the Questionnaire outlines specific questions to which responses are sought, Participants are also invited to comment on or raise on an unsolicited basis suggestions or other issues that they feel could provide a more effective solution, cost advantages or a better quality outcome.

Responses

Participants are encouraged to respond to all sections relevant to them during the interview.

Post interview, we encourage participants to submit a written response into the tables below if they think of a further response not covered. For clarity, Participants need only complete this form if they wish: by e-mail to REZ.Engagement@mbbgroup.com.au

Specific Questions for Participants

#	Question	What we need to know	How would we use this information	Response
1	Given the information available to you including through this Market Engagement, is your company interested in the opportunity to be involved with the Roadmap and if so the role(s) it would seek?	• Understand the interests of the stakeholder and relevance of the feedback	• Gauge relevance and interest for future consultation	•
2	What supply chain issues are you currently experiencing? How do you anticipate these will change in the future? How do these issues impact your project/business?	• The current capacity and capabilities of the supply chain locally and globally. • What are the barriers to ramping up the supply? • Where future issues in the supply chain might arise given trends to increase renewables globally to meet emission reduction targets. E.g. limited supply of copper, semi-conductors or skilled workers • How do these issues impact projects (approvals, cost, time)?	• Identify the gaps and constraints in the current local and global market and possible interventions • Take these issues into account when planning delivery for the Roadmap	
3	What is your perception or knowledge about the capacity of the EPC contractor market to undertake your project(s)? Do you expect challenges in procuring an EPC contractor? Who are your preferred partners?	• The current capacity and capabilities of the EPC contractor market locally and globally • Future constraints in capacity of the EPC market • What are the barriers in the EPC market	• Identify the gaps and constraints in the current market and possible interventions • Take these issues into account when planning delivery for the Roadmap	•

#	Question	What we need to know	How would we use this information	Response
4	Which components of your projects are sourced from local suppliers and which are imported? What proportion of your local suppliers are small or medium enterprises (SMEs) and what do they supply? For example: Steelwork, concrete, Control Equipment, Substation Equipment, Cable, PV Modules, Inverters, Turbines, Turbine Blades, Towers, Batteries, Other major elements Note a small or medium enterprise (SME) is a business with fewer than 200 full-time equivalent (FTE) employees.	• Test the findings from literature. What proportion is local. • What proportion of goods purchased locally are from local SMEs (firm with fewer than 200 FTE) and the type of components or services supplied. Note a preference in government procurement to benefit SMEs is permitted under the *Public Works and Procurement Act 1912*.	• Identify current local and SME capacity to supply electricity infrastructure projects	•
5	What is preventing you from sourcing more content from within Australia or local SMEs? Are there any parts of the supply chain that could be developed within Australia with appropriate government support?	• If not using local suppliers, why? • What is the biggest pain point(s) for suppliers when it comes to sourcing local content • Which components could be supplied locally?	• Identify where capacity of local supply could be increased and what investments would be required • Determine whether preferencing SMEs could increase use of local suppliers	
8	What is the size and skills make-up of your workforce to deliver projects? Is this expected to change going forward?	• Does NSW have the local workforce needed to deliver the Roadmap infrastructure? • Would there be any constraints in the workforce given ramp up in	• Identify current and potential future gaps in the NSW workforce for delivery of the Roadmap and where local workforce development is appropriate	

#	Question	What we need to know	How would we use this information	Response
		construction in NSW and other states and overseas?	• Identify potential interventions to increase employment of local workers and indigenous participation	
9	What proportion of your workforce are from other countries or interstate? Do you have an Aboriginal participation target? What would you or NSW need to provide to develop, attract and maintain a NSW based workforce? What factors would discourage you to maintain a workforce in NSW?	• What is needed to attract and keep a NSW workforce to deliver the Roadmap infrastructure e.g. competitive wages, training, housing, good internet and transport	• Identify current practice in employment of local and indigenous workers • Identify potential interventions to increase employment of local workers	
10	If there was a NSW Government requirement to achieve a target local content, what would be the challenges and opportunities? What levels of local content could be achieved economically and what would be the impact on cost? For example, sourced within NSW or the region, or a minimum requirement for small and medium enterprises, local employment or Aboriginal participation	• How would buying local/employing local workers impact project costs? • Does buying local always increase costs for the project or do savings (on transport, import duties, accommodation for overseas workers, apprentices' wages etc) offset costs? • Is buying local considered when purchasing or overlooked? • Would increased costs be passed on to customers? Would this impact electricity consumers?	• Determine what types of requirements to include for procurement processes • How these might be introduced to limit impacts on electricity consumers • Identify measures for increased indigenous participation	

#	Question	What we need to know	How would we use this information	Response
11	What do you see as key to supporting and encouraging the use of local resources / suppliers / workers?	• What are the key solutions to encouraging local content	• Relative importance of potential interventions	

General Questions for Participants

The following table sets out questions that prompt responses from Participants in relation to any additional issues, risks, concerns or opportunities which you would like to comment on, relating to the rollout of the REZ program or the development of local opportunities on renewable developments. Please copy and paste the section below as many times as required if you wish to raise more than one issue.

#	Question	Response
1	What is the key issue, risk, concern, opportunity which you would like to comment on?	
2	How do you consider the issue can be addressed satisfactorily?	
3	Are there any innovative approaches to resolving the issue of which you are aware?	
4	Please provide any other comments, suggestions, feedback or concerns about any aspect of the supply chain for the Roadmap that you would like to provide.	

NSW Electricity Infrastructure Roadmap

Supply Chain Analysis Questionnaire (Manufacturer)

28 May 2021

Name of Participant	Organisation

Background

This Market Engagement questionnaire (**Questionnaire**) seeks views of potential participants (**Participants**) with respect to the supply chain for renewable energy projects under the NSW Electricity Infrastructure Roadmap (**Roadmap**). The Market Engagement is being conducted by MBB Group on behalf of the NSW Department of Planning, Industry and Environment (**DPIE**).

This Questionnaire should be read in conjunction with the introduction email from DPIE, which provides information about the Roadmap and consultation activities.

Feedback from Participants

The responses from Participants will be used to inform future policy and programs by NSW Government. Supplementary questions may be issued to Participants if required.

While this Questionnaire and other Market Engagement documents may discuss the development of Renewable Energy Zones and electricity infrastructure in a context that may suggest that it will proceed, there is no guarantee that this will occur.

Information deficiencies

For the purpose of responding to this Market Engagement, where information deficiencies exist, Participants are invited to state assumptions, where appropriate, about the Roadmap or other circumstances to enable discussion or comment on relevant issues.

All Participants are encouraged to comment in detail on information that will be required in subsequent phases of the development of the Roadmap to enhance the effectiveness of any subsequent procurement process.

Unsolicited issues

While the Questionnaire outlines specific questions to which responses are sought, Participants are also invited to comment on or raise on an unsolicited basis suggestions or other issues that they feel could provide a more effective solution, cost advantages or a better quality outcome.

Responses

Participants are encouraged to respond to all sections relevant to them during the interview.

Post interview, we encourage participants to submit a written response into the tables below if they think of a further response not covered. For clarity, Participants need only complete this form if they wish: by e-mail to REZ.Engagement@mbbgroup.com.au

Planning, Industry & Environment

Specific Questions for Participants

#	Question	What we need to know	How would we use this information	Response
1	Given the information available to you including through this Market Engagement, is your company interested in the opportunity to be involved with the Roadmap and if so the role(s) it would seek?	• Understand the interests of the stakeholder and relevance of the feedback	• Gauge relevance and interest for future consultation	
2	What supply chain issues are you currently experiencing? How do you anticipate these will change in the future? How do these issues impact your project/business? Do you foresee any capacity issues in delivering the volumes required to deliver the Roadmap?	• The current capacity and capabilities of the supply chain locally and globally. • What are the barriers to ramping up the supply? • Where future issues in the supply chain might arise given trends to increase renewables globally to meet emission reduction targets. E.g. limited supply of copper, semi-conductors or skilled workers • How do these issues impact projects (approvals, cost, time)?	• Identify the gaps and constraints in the current local and global market and possible interventions • Take these issues into account when planning delivery for the Roadmap	
3	Do you currently have manufacturing facilities in Australia? Which components of your products are sourced from local suppliers and which are imported? What proportion of your local suppliers are small or medium enterprises (SMEs) and	• Test the findings from literature. What proportion is local. • What proportion of goods purchased locally are from local SMEs (firm with fewer than 200 FTE) and the type of components or services supplied. Note a preference in government procurement to benefit SMEs is permitted under the	• Identify current local and SME capacity to supply electricity infrastructure projects	

#	Question	What we need to know	How would we use this information	Response
	what do they supply? Note a small or medium enterprise (SME) is a business with fewer than 200 full-time equivalent (FTE) employees.	*Public Works and Procurement Act 1912*.		
4	Given the size of the potential demand in NSW and across Australia, would any consideration be made of setting up a local manufacturing facility? What if NSW government specified local content requirements? What barriers are there to doing this? What is the potential cost differential (can be qualitative description rather than exact numbers) What is preventing you from sourcing more content from within Australia or local SMEs? Are there any parts of the supply chain that could be developed within Australia with appropriate government support?	• If not using local suppliers, why? • What is the biggest pain point(s) for suppliers when it comes to sourcing local content • Which components could be supplied locally?	• Identify where capacity of local supply could be increased and what investments would be required • Determine whether preferencing SMEs could increase use of local suppliers	
5	What do you see as key to supporting and encouraging the use of local resources / suppliers / workers?	• What are the key solutions to encouraging local content	• Relative importance of potential interventions	

General Questions for Participants

The following table sets out questions that prompt responses from Participants in relation to any additional issues, risks, concerns or opportunities which you would like to comment on, relating to the rollout of the REZ program or the development of local opportunities on renewable developments. Please copy and paste the section below as many times as required if you wish to raise more than one issue.

#	Question	Response
1	What is the key issue, risk, concern, opportunity which you would like to comment on?	
2	How do you consider the issue can be addressed satisfactorily?	
3	Are there any innovative approaches to resolving the issue of which you are aware?	
4	Please provide any other comments, suggestions, feedback or concerns about any aspect of the supply chain for the Roadmap that you would like to provide.	

Appendix 3 – DPIE Probity Protocol

Supply chain analysis consultation: Stakeholder interviews

Probity Protocol

Purpose

The Department is holding one-on-one interviews to identify critical constraints in the supply chain for electricity infrastructure and opportunities to increase local content to support the implementation of the NSW Electricity Infrastructure Roadmap.

Approach

Interviews will be held individually with each stakeholder. The Department has engaged MBB Group to facilitate the interviews and where appropriate, relevant personnel from the Department may participate in the interviews to provide additional technical, operational, commercial, legal and/or corporate knowledge to address the stakeholder's queries.

Prior to the commencement of the interview, the stakeholders will be required to acknowledge the below protocol.

Probity framework and meeting protocols

- No electronic recording of the engagement is permitted. Pursuant to the Surveillance Devices Act 2007, it is prohibited to record a conversation unless all parties provide their consent to the recording. DPIE and the staff involved in this conference, do not provide their consent to the recording of this video or phone-conference, or any video or phone-conference to which they are a party.
- Each stakeholder will be allowed a maximum of 60 minutes for the one-on-one workshop.
- Stakeholders will be provided with similar access to Departmental representatives and advisers at the interviews.
- Stakeholders will be provided with similar access to information noting that applicants that are better prepared for interviews may make better use of the opportunity.
- Information exchanged with the Department will not in any way constitute an endorsement, approval, instruction or evaluation of a concept or methodology. If the stakeholder decides to move forward with an opportunity arising from the information exchanged at any point in time, the stakeholder must form its own view on how to incorporate any feedback into its solution design.
- A failure by the Department to comment on an idea submitted in a stakeholder interview will not in any way constitute endorsement, approval or otherwise of a (future) application.
- Participation in the interviews is voluntary. Stakeholders may decline to answer a question from the Department, and vice versa.
- Participation in the interviews is non-assessable. How a stakeholder interacts in an interview or whether the stakeholder chooses to participate will not influence any future procurements by the Department or under the Electricity Infrastructure Roadmap
- Participation in the interviews is confidential. It is expected that stakeholders will treat all interview content, including materials provided by DPIE in advance, as confidential materials.

Similarly, stakeholders can expect that information presented to DPIE at interviews will be treated in confidence by DPIE.

- While conversations held at sessions are expected to be treated as confidential, any stakeholder revealing information that they regard as being specific intellectual property of their organization should clearly identify this at the time.
- While all information provided by the Department is in good faith, and is with best reasonable efforts, it is not for reliance and is subject to change.
- If a stakeholder proposes an approach that the Department has previously investigated or determined to be not feasible, the stakeholder may be informed of this. However, feedback from the Department should not be taken as a direction by the Department to do, or not do, anything associated with any future procurements by the Department or under the Electricity Infrastructure Roadmap.
- Departmental personnel and their advisers will not respond to any requests from the stakeholders seeking a preliminary view of future procurements under the future procurements by the Department or under the Electricity Infrastructure Roadmap.
- Separate records of the workshops may be maintained by the stakeholder and the Department for their own purposes.
- The Department notes that it may not be in a position to respond to all participant enquiries during the course of the workshop. The Department reserves the right to not provide answers to questions raised by participants or to take questions on notice for response at a later time.
- You are welcome to contact DPIE's Probity Manager Richard O'Neill if you have any probity concerns (E: roneill@ocm.net.au/ M: 0421 918 034).
- All participants will be asked to acknowledge that they understand these meeting protocols at the start of your interview.
- All DPIE staff and advisors attending the one on one interview have agreed to a Probity and Process Plan which, amongst other matters, bind DPIE staff to confidentiality and conflict of interest protocols to protect the interests of both DPIE and applicants.

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