ACIL ALLEN

Report to Department of Planning and Environment

Consumer costs and economic benefits for Renewable Energy Sector Board's Plan

Final report

CREDIT: ISTOCK.COM/ZAMBEZISHARK ©

About ACIL Allen

ACIL Allen is a leading independent economics, policy and strategy advisory firm, dedicated to helping clients solve complex issues.

Our purpose is to help clients make informed decisions about complex economic and public policy issues.

Our vision is to be Australia's most trusted economics, policy and strategy advisory firm. We are committed and passionate about providing rigorous independent advice that contributes to a better world.

Contents

Contents

Contents

Figures

Contents

Tables

Contents

Contents

Contents

Boxes

Executive summary

ACIL Allen was engaged by the Department of Planning and Environment (the Department) to undertake modelling on the costs and benefits associated with possible minimum requirements for local content for modernising the NSW electricity system, as well as a survey of NSW electricity customers' willingness to pay for the broader benefits associated with local content requirements.

The modelling and analysis will inform a plan that is being prepared by the Renewable Energy Sector Board (the Board) which sets out how to cost effectively achieve the following objectives, in the construction of generation, storage and network infrastructure as required by the *Electricity Infrastructure Investment Act 2020* (the Act) and associated Regulations:

- to maximise the use of locally produced and supplied goods and services
- to maximise the employment of suitable qualified local workers
- to foster opportunities for apprentices and trainees
- to protect the financial interests of NSW electricity customers
- to be consistent with Australia's international trade obligations.[1]

For the purposes of this report, local content refers to content from Australia and New Zealand.

Overview of the results

While the investment required to increase local content is significant, based on the assumptions that have been used in the modelling, increasing local content is projected to increase real economic output, real income and employment in the period to 2040-41. The increase in real economic output for each of the local content scenarios in Table ES 1.

Table ES 1 Projected increase in real economic output associated with the local content scenarios (in 2021 dollars)

	Modest local content scenario	Ambitious local content scenario
Australia	$0.2 billion	$0.7 billion
New South Wales	$0.5 billion	$1.3 billion

Note: Net present value using a 7 per cent discount rate

Source: ACIL Allen analysis

Increasing local content is estimated to increase retail electricity bills for NSW electricity customers. The weighted average increase over the period from 2023-24 to 2040-41 is 0.6 per cent under the modest local scenario and 1.6 per cent under the ambitious local content scenario (refer

[1] *Electricity Infrastructure Investment Act 2020*, section 8(1); Electricity Infrastructure Investment Regulation 2021, regulation 5

Table ES 10 for the average increase by customer type and Figure ES 2 for the annual increase by customer type).

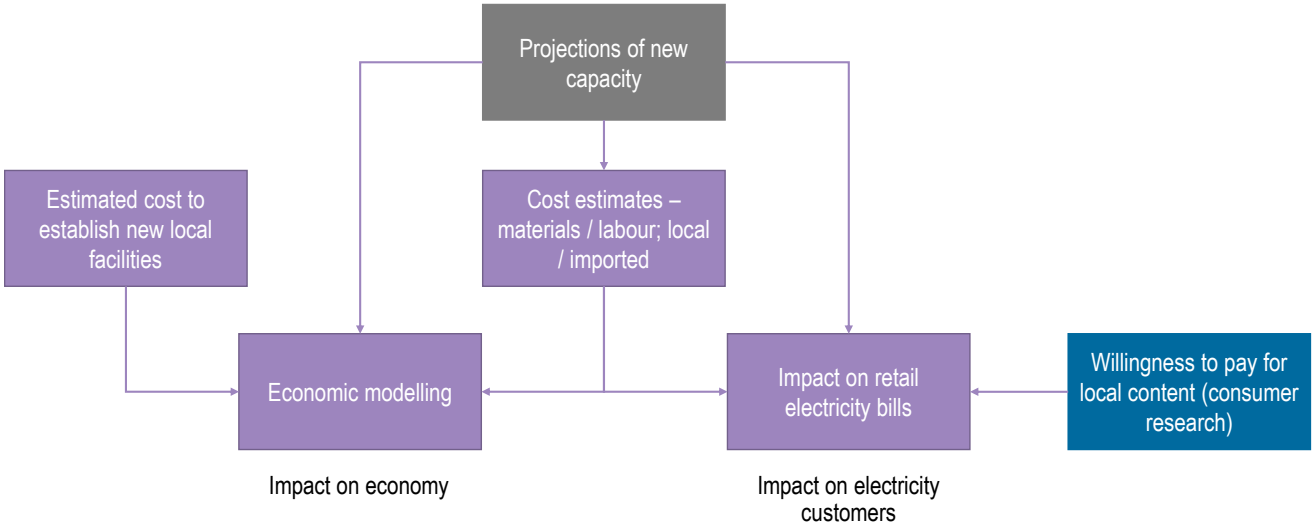
The estimated increases in retail electricity bills are less than the amount that customers have indicated that they are willing to pay. Survey participants indicated they are willing to pay, on average, 5.2 per cent more for somewhat more locally produced materials, 8.1 per cent more for as much locally produced materials as possible, and 9.7 per cent more for as much locally produced materials as possible as well as more local workers, contribution by apprentices and trainees, and participation by First Nations people.

Overview of the methodology

The modelling and analysis undertaken for this report comprised six elements as illustrated in Figure ES 1**.**

1. **Projections of new capacity** – the modelling and analysis was based on indicative projections of the amount of new generation and network capacity to be installed in New South Wales to 2040-41. The outcomes of the modelling and analysis will be different if different projections are assumed.
2. **Cost estimates** – these were developed for each technology projected to be deployed, to provide a breakdown of the costs by material and labour, and by local and imported content.
3. **Cost to establish new facilities** – where local content was assumed to increase, it was assumed that new facilities would be required for local assembly or manufacture. The costs to establish these facilities were estimated.
4. **Economic modelling** – the impact of increased local content on the economy and jobs was estimated using Input-Output (IO) modelling (to assess the gross contribution) and Computable General Equilibrium (CGE) modelling (to assess the net contribution, including the investment and price effects).
5. **Retail electricity bills** – the impact of increased local content requirements on retail electricity bills was estimated for different types of NSW electricity customers – residential, small business, medium commercial and industrial (C&I) and large C&I customers.
6. **Willingness to pay** – consumer research was undertaken to estimate the amount that NSW electricity customers are prepared to pay to increase local content.

Figure ES 1 Overview of the methodology for modelling the costs and benefits of increased local content



Source: ACIL Allen

Scenarios modelled

Three local content scenarios were modelled:

- *Base case scenario (or reference case)* — the business as usual (least cost) case where it is assumed that there are no minimum local content requirements. The base case scenario is used as a benchmark (floor) with which to compare the results of scenarios with increased local content.
- *Modest local content scenario* — the case where there is a modest level of local content.
- *Ambitious local content scenario* — the case where there is an ambitious level of local content.[2]

The key assumptions for each of these scenarios are summarised in Table ES 2.

Table ES 2 Key characteristics of the local content scenarios

Scenario	Supply chain inputs	Employment, skills and knowledge transfer and opportunities for First Nations
Base case	Lower bound (floor) for local content – consists of components that would be sourced locally or would be imported, regardless of market conditions, because it would not be competitive to source them internationally. Other components could be locally assembled or manufactured or imported based on pricing at the time a contract is awarded, which is dependent, for example, on capacity and the exchange rate. These components are assumed to be imported under the base case, which therefore represents a lower bound for local content that is not dependent on short-term market conditions.	Current minimum requirements not met, no self-nominated targets or stretch goals
Modest	Similar to the base case, but the components that could be imported or could be locally assembled or manufactured are assumed to be locally assembled or manufactured.	Current minimum requirements met, no self-nominated targets or stretch goals

[2] This scenario aligns with the stretch goals in the Renewable Energy Sector Board's Plan.

Scenario	Supply chain inputs	Employment, skills and knowledge transfer and opportunities for First Nations
Ambitious	Where the quantities of an imported component could justify establishing a greater local presence, imported components are substituted with local assembly or manufacture with a cost premium applied (which varies by component).	Current minimum requirements met, self-nominated targets and stretch goals met

Note: Current minimum requirements are:

- Employment, skills and knowledge transfer – 20% of workforce are learning workers and apprentices (NSW Government Infrastructure Skills Legacy Program)
- Opportunities for First Nations – 1.5% of project value directed towards First Nations (NSW Government Aboriginal Procurement Policy)

Source: ACIL Allen

Both the modest and ambitious local content scenarios require new facilities to be developed. From a practical perspective, given the lead times associated with developing new facilities, they could not be achieved in the short term (within two years).

Cost estimates

A range of assumptions were made to estimate the costs associated with local content, which are described below. Given the uncertainty associated with these assumptions, we have tended to make, what we considered to be, more conservative assumptions. For example, we included cost premia that are biased higher rather than lower and not assumed that imported labour used for installation during the development phase will be substituted with local labour.

Development phase

For the purposes of the modelling, the total costs for developing new generation and network capacity are the same as those used by the Australian Energy Market Operator (AEMO) for planning and forecasting purposes. The costs have been assumed to reduce over time in line with AEMO's assumptions and to vary based on location in line with AEMO's regional cost factors.

A breakdown of the costs into material and labour, and imported and local content has been informed by WT Partnerships and previous work commissioned by the Department, which included significant stakeholder consultation. A high level breakdown of the costs of each of the technologies under the base case is set out in Table ES 3.

Table ES 3 Development of cost estimates under the base case, development phase

Technology	Cost zone	Materials	Labour	Other (delivery and indirect)
		% of capex	% of capex	% of capex
Wind	Low	65%	15%	20%
	Medium	65%	16%	19%
	High	65%	16%	19%
Large scale solar PV	Low	57%	21%	21%
	Medium	56%	22%	22%
	High	55%	22%	22%
Pumped hydro (8 hours)	All	29%	43%	28%
Battery storage	All	79%	19%	3%
Connection assets	All	35%	42%	23%

Technology	Cost zone	Materials	Labour	Other (delivery and indirect)
Transmission network augmentation	All	39%	58%	4%

Note: Imported materials are classified as materials for the purposes of the economic modelling. They include materials and labour components, which are not local.
Source: AEMO's 2021 Inputs and assumptions report; ACIL Allen based on previous modelling

A range of assumptions were made as to the imported content that could be substituted with local content and the cost premium for doing so. These assumptions assume there is no time lag to substitute imported content with local content, although it is recognised from a practical perspective that there is a lead time required to establish local facilities.

A cost premium for increasing the participation by learning workers and First Nations people was assumed based on employers paying the wages for apprentices while in formal training for, on average, half a day per week plus tuition fees, and the costs associated with books and tools (2 per cent for the modest local content scenario). The cost premium was increased to 5 per cent for the ambitious local content scenario.

The assumptions that have been made for each of the technologies for each of the local content scenarios are set out in Appendix B. By applying these assumptions, the estimated local content proportion of each of the relevant technologies under each of the local content scenarios during the development phase is as set out in Table ES 4.

Table ES 4 Estimated local content under each scenario, development phase

Technology	Base case	Modest local content scenario	Ambitious local content scenario
Generation, storage and firming technologies (including connection assets)			
Wind	26%	51%	72%
Large scale solar PV	44%	50%	81%
Pumped hydro (8 hours)	65%	68%	86%
Battery storage	20%	23%	78%
Network augmentation			
Transmission	66%	77%	93%

Note: Local materials, labour and indirect costs as a proportion of total costs
Source: ACIL Allen assumptions

Operating and maintenance phase

For the purposes of the modelling, the same total operating and maintenance costs (O&M) as used by AEMO for planning and forecasting purposes have been used. Assumptions on the breakdown of the operating and maintenance costs into materials and labour have been made based on previous modelling. These assumptions are set out in Table ES 5.

Table ES 5 Development of cost estimates under the base case, operating and maintenance phase

Technology	Cost zone	Materials	Labour
		% of O&M	% of O&M
Wind	Low	89%	11%
	Medium	89%	11%
	High	88%	12%
Large scale solar PV	Low	26%	74%

Technology	Cost zone	Materials	Labour
	Medium	25%	75%
	High	24%	76%
Pumped hydro (8 hours)	All	38%	62%
Battery storage	All	80%	20%
Connection assets	All	67%	33%
Transmission network augmentation	All	89%	11%

Note: Imported materials are classified as materials for the purposes of the economic modelling. They include materials and labour components, which are not local.
Source: AEMO's 2021 Inputs and assumptions report; ACIL Allen based on previous modelling

The labour component of O&M is assumed to be local with a cost premium applying under the modest and ambitious local content scenarios. The cost premium is the same as that assumed for the development phase.

The breakdown of the materials component of O&M is assumed to be the same as for the investment during the development phase for the relevant scenario.

By applying these assumptions, the estimated local content proportion of each of the relevant technologies under each of the local content scenarios during the operating and maintenance phase is as set out in Table ES 6.

Table ES 6 Estimated local content under each scenario, operating and maintenance phase

Technology	Base case	Modest local content scenario	Ambitious local content scenario
Generation, storage and firming technologies (including connection assets)			
Wind	42%	59%	75%
Large scale solar PV	69%	71%	81%
Pumped hydro (8 hours)	73%	75%	82%
Battery storage	32%	34%	79%
Network augmentation			
Transmission	71%	78%	89%

Note: Local materials, labour and indirect costs as a proportion of total costs
Source: ACIL Allen assumptions

Cost to establish new facilities

The new facilities that are assumed to be developed under the modest and ambitious local content scenarios are set out in Table ES 7.

Table ES 7 Assumed new facilities

Technology	Modest local content scenario	Ambitious local content scenario
Wind	Local assembly of turbines	Local manufacture of turbines
Solar	Nil	Local manufacture of modules
Pumped hydro	Nil	Local manufacture of pumps / turbines
Transmission lines	Local manufacture of towers	Local manufacture of towers and conductors

Source: ACIL Allen based on information provided by the Department

The costs associated with establishing new facilities include the costs of land, the building shell and the fitout (including specialised equipment) for that building. It has been assumed that for each new facility established:

- the cost for land in regional NSW is in the order of $100,000[3]
- the cost of the building shell is in the order of $400,000[4]
- the cost of the fitout (including specialised equipment) is in the order of:
  - $20 million for local assembly of wind turbines, and local manufacture of solar modules, hydro pumps / turbines and transmission line towers
  - $40 million for local manufacture of wind turbines and high voltage conductors.

Costs associated with increasing local content

Increasing local content requires additional investment in new facilities, additional investment during the development phase and higher costs during the operating and maintenance phase, as summarised in Table ES 8. The total additional cost associated with the modest local content scenario is $1.9 billion and with the ambitious local content scenario is $4.7 billion (discounted to 2021).

Table ES 8 Total estimated additional costs associated with the local content scenarios (in 2021 dollars)

	Modest local content scenario	Ambitious local content scenario
New facilities	$0.0 billion	$0.1 billion
Development phase	$1.6 billion	$4.1 billion
Operating and maintenance phase	$0.2 billion	$0.6 billion
Total	**$1.9 billion**	**$4.7 billion**

Note: Investment discounted to 2021 using the discount rates in Table 2.9

Source: ACIL Allen analysis

Increasing local content will increase real economic output

Real economic output is a measure of the aggregate output generated by an economy over a period of time (typically a year). At a national level, real economic output refers to Gross Domestic Product (GDP). At the state level, economic output (or GDP equivalent) is called Gross State Product (GSP). Economic output is one of the primary indicators used to gauge the health of the economy as it measures the amount of economic activity happening in a country/state/region. It represents the total dollar value of all goods and services produced over a specific time period — it can be thought as the size of the economy.

The local content scenarios will have two effects:

- an investment effect during the construction phase (where local economic activity increases as a result of the projects)

[3] Based on the value of industrial land in Armidale. For example, the value of 38 Myrtle Drive is $182,000 for 17.38 hectares https://portal.spatial.nsw.gov.au/portal/apps/webappviewer/index.html?id=2536c8e4882140eb957e90090cb0ef97

[4] Based on https://www.centralbuild.com.au/much-cost-build-factory/

— a price effect during the operational phase (where the costs of the local content scenarios will be passed through to consumers in the form of increased energy prices).

The additional investment/expenditure during the construction of the projects would temporarily increase the demand for goods and services from the construction supply chain (e.g. construction services, structural metal product manufacturers, professional services, etc.). Demand for these intermediate products and services then leads to multiple rounds of flow-on (or indirect) industry effects. The increase in outputs across the construction supply chain leads to the creation of new jobs across the economy. The extra income and employment from the output of the construction industry leads to an increase in consumption (both from people directly employed in the construction industry, and throughout the construction industry's supply chain).

These changes in economic activity due to the investment effect associated with an increase in local content are reflected in an increase in real output in the NSW economy and a decrease in real output in the rest of the Australian economy under both local content scenarios. The decrease in output across the rest of Australia is driven by the redirection of economic activity from these states and territories to NSW.

These additional investment effects are offset by the effect of increases in energy prices during the operational phase of the projects to recover the additional costs of increased local content. Increased energy prices lead to a decline in demand for goods and services in the NSW economy as residents have less income to spend in these other sectors. While the increase in energy prices lowers demand in NSW, it increases output across the rest of Australia as some economic activity relocates to other states with lower relative energy prices.

The net impact of these two effects is (relative to the base case):

— an increase in real economic output in NSW (i.e. real gross state product (GSP)) by a cumulative total of between $683 million and $1.7 billion under the modest and ambitious local content scenarios, respectively (with a net present value of between $544 million and $1.3 billion). This reflects the fact that the effects of the additional investment/expenditure more than offset the effects of the increases in energy prices, resulting in an overall gain in GSP over the analysis timeframe (i.e. the benefits of the local content scenarios are greater than the costs associated with these requirements over the analysis timeframe)

— a small decrease in real economic output in Australia as a whole (i.e. real gross domestic product (GDP)) by a cumulative total of $34 million under the modest local content scenario. However, in net present value terms, it is projected that the modest local content scenario will result in an increase of $200 million in GDP. This 'discrepancy' is explained by the timing of the positive and negative impacts of the scenario, with the increases in GDP happening earlier in the period of analysis and the decreases happening later in the period, which results in a net increase in GDP in present value terms

— a cumulative increase in Australia's GDP of $263 million under the ambitious local content scenario (with a net present value of $675 million).

To place these projected changes in economic output in perspective:

— the discounted present value (using a 7 per cent discount rate) of the change in NSW output is equivalent to between 0.1 per cent and 0.2 per cent of NSW's current GSP under the modest and ambitious local content scenarios, respectively

— the discounted present value (using a 7 per cent real discount rate) of the change in national output is equivalent to between 0.01 and 0.03 per cent of Australia's current GDP.

The projected increase in real economic output for each of the local content scenarios is summarised in Table ES 9. If lower cost premia for local content had been assumed, the total additional investment associated with the local content scenarios would have been lower, but the

investment effect on GDP would also have been lower, although this would have been offset by a lower price effect.

Table ES 9 Projected increase in real economic output associated with the local content scenarios (in 2021 dollars)

	Modest local content scenario	Ambitious local content scenario
Australia	$0.2 billion	$0.7 billion
New South Wales	$0.5 billion	$1.3 billion

Note: Net present value using a discount rate of 7 per cent

Source: ACIL Allen analysis

Increasing local content will increase real income

The extent to which the NSW residents will benefit from the additional economic activity produced by increasing the local content associated with the projected new investment depends on the level of domestic ownership of the capital utilised in the projects, wealth transfers undertaken by the NSW Government as a result of the taxation revenues generated by the project and trade effects.

Given that a significant proportion of the potential employees for the development will be sourced locally, this will provide a significant boost to local incomes. However, as a proportion of the projects are assumed to be owned by overseas shareholders, a portion of the wealth generated by the economic activity is transferred outside of Australia.

The NSW Government will receive additional taxes derived from the developments and these taxes will be spent within the NSW economy. The additional demand for capital and labour stemming from the projects would also result in an improvement of the terms of trade relative to the base case. Overall, in net terms it is projected that the change in income resulting from increasing local content associated with the projected new investment will be significantly higher than the change in economic output.

More specifically, over the period 2020-21 to 2040-41, the increase in local content is projected to (relative to the base case):

— increase the real income of NSW by a cumulative total of between $2.6 and $5.0 billion under the modest and ambitious local content scenarios, respectively. The present value of this change is equivalent to a one-off increase in real income of between $2.1 and $4.2 billion under the modest and ambitious local content scenarios, respectively

— reduce the real income of other states and territories (rest of Australia) as a result of the pull of activity towards NSW. While the rest of Australia will benefit somewhat from the price effect through terms of trade gains, these are not enough to offset the reductions in demand due to the local content effect

— increase the real income of Australia as a whole by a cumulative total of between $2.5 and $4.1 billion, under the modest and ambitious local content scenarios, respectively (with a net present value of between $2.1 and $3.8 billion).

To place these projected changes in income in perspective, the value in 2020-21 of this whole of life impact[5] is equivalent to increasing the average income of all current residents of:

— NSW by between $256 and $518 per person under the modest and ambitious local content scenarios, respectively

[5] That is, the discounted present values of the projected changes in real income using a 7 per cent real discount rate.

— Australia as a whole by between $84 and $149 per person under the modest and ambitious local content scenarios, respectively.

Increasing local content will increase employment

The economic modelling projects that the increase in local content associated with the projected new investment will result in a net increase in jobs across Australia relative to the base case. Indeed, over the period 2020-21 to 2040-41 it is projected that between 19,185 and 32,984 employee years[6] of full time equivalent (FTE) direct and indirect jobs will be created in Australia under the modest and ambitious local content scenarios, respectively, relative to the base case. More specifically, over the period 2020-21 to 2040-41 the local content scenarios are projected to increase total employment (by place of residence) relative to the base case in:

— NSW as a whole by between 13,236 and 23,182 employee years under the modest and ambitious local content scenarios, respectively (implying an average annual increase of between 662 and 1,159 FTE jobs)

— Australia as a whole by between 19,185 and 32,984 employee years under the modest and ambitious local content scenarios, respectively (an average annual increase of between 959 and 1,649 FTE jobs).

These impacts may be smaller than expected because, given Australia's strong labour market (characterised by low levels of unemployment and high rates of labour market participation), there is only a small pool of people who are currently not in employment that could be employed directly and indirectly on the projects. The projects and the flow on industries will therefore need to attract workers from other industries with the net result being that the cumulative additional job impact is not as high as might be expected.

Additional employment associated with the increased local content is projected to peak:

— in 2031 at around 1,870 FTE jobs in NSW and 780 FTE jobs in the rest of Australia under the modest local content scenario

— in 2027 at around 3,410 FTE jobs in NSW and 1,018 FTE jobs in the rest of Australia under the ambitious local content scenario.

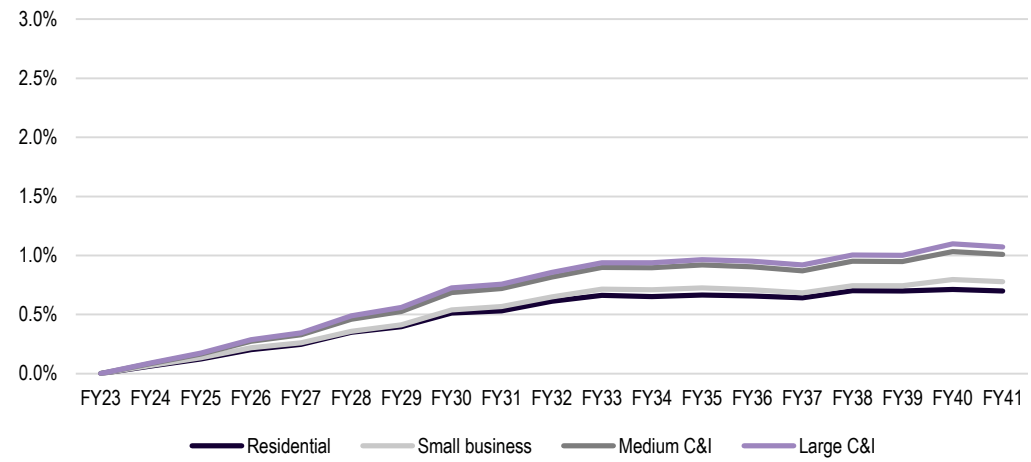
Customers are willing to pay for increased local content

As illustrated in Figure ES 2, based on the assumptions that have been used in this analysis, the impact of the local content scenarios on retail electricity bills for NSW electricity customers is estimated to be up to 1.1 per cent under the modest local content scenario and 2.7 per cent under the ambitious local content scenario. The increases in the retail electricity bills for residential and small business customers are estimated to be lower than for medium and large C&I customers.

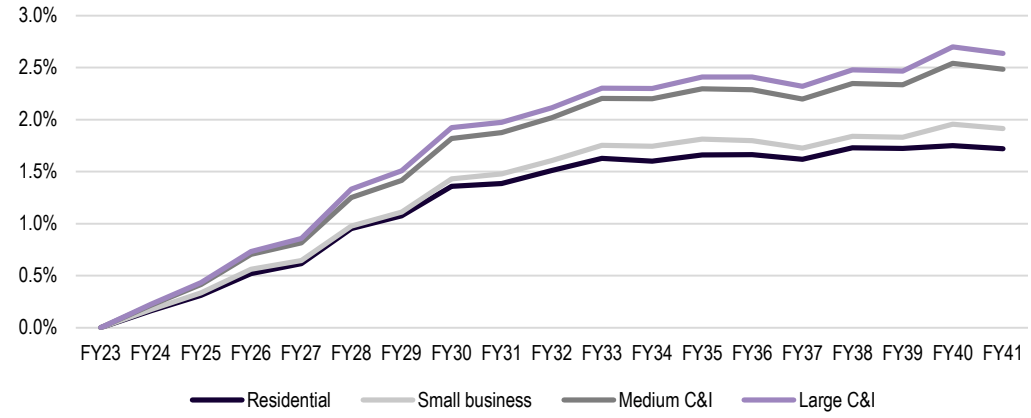
Figure ES 2 Estimated impact of local content scenarios on retail electricity bills, NSW weighted average

Modest local content scenario

[6] An employee year is employment of one full time equivalent (FTE) person for one year or one 0.5 FTE person for two years.



Ambitious local content scenario



Source: ACIL Allen

The average estimated increases in retail electricity bills over the period from FY24 to FY41 under each local content scenario are set out in Table ES 10.

Table ES 10 Average estimated increase in retail electricity bills, FY24 to FY41

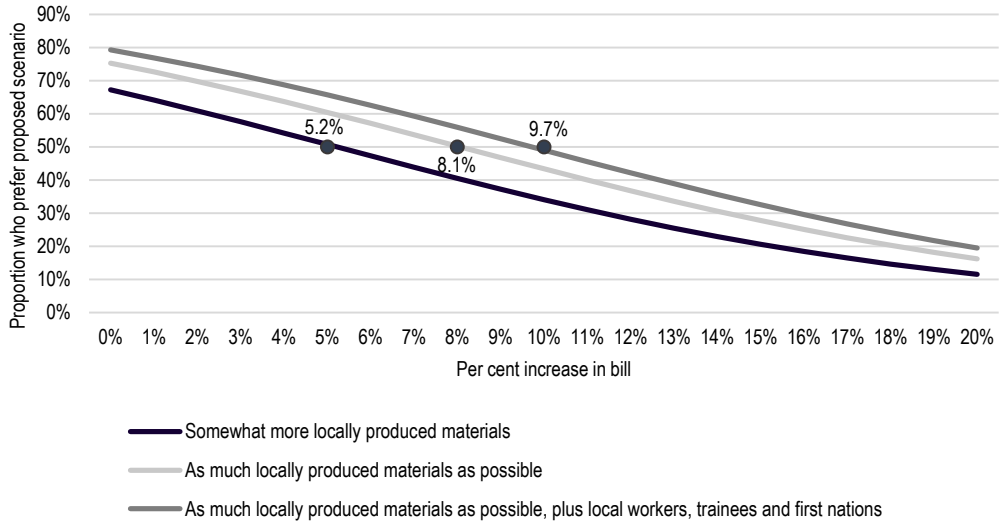
Type of customer	Modest local content scenario	Ambitious local content scenario
Residential	0.5%	1.3%
Small business	0.5%	1.4%
Medium C&I	0.7%	1.7%
Large C&I	0.7%	1.8%
Weighted average	0.6%	1.6%

Source: ACIL Allen

The estimated increases in retail electricity bills for increased local content are lower than the amount that survey participants indicated they are willing to pay for increased local content.

Figure ES 3 illustrates that survey participants indicated they are willing to pay, on average, 5.2 per cent more for somewhat more locally produced materials, 8.1 per cent more for as much locally produced materials as possible, and 9.7 per cent more for as much locally produced materials as possible as well as more local workers, contribution by apprentices and trainees, and participation by First Nations people. Survey participants indicated that they are not willing to pay for increased participation by First Nations people.

Figure ES 3 Willingness to pay for increased local content



Source: ACIL Allen

Practical implications

One of the most significant challenges to increase local content is to address a "chicken and egg" situation.

New facilities will not be established unless there is sufficient certainty of a sustainable market over the longer term, with the legislation in and of itself not considered by stakeholders consulted to provide sufficient certainty to invest, as it does not mandate a minimum level of local content. Rather, it provides discretion to the Consumer Trustee to balance the objectives in the Act and associated Regulations.

There are previous examples of the boom and bust cycle where facilities have been established locally to meet an increase in demand but shut down when demand declined. To avoid a boom and bust cycle, it is recommended that governments at the Commonwealth and State level coordinate energy policies that bring forward new generation capacity and network augmentation. By doing so, any new facilities established in New South Wales could supply projects in other states, thus achieving continuity of operation over time, augmenting the benefits identified in this report.

Additionally, local manufacturers need to have an established track record before engineering, procurement and construction (EPC) contractors are prepared to include their product in a tender for a project. For example, one EPC requires local manufacturers to be certified before proposing them as a subcontractor in any tender. To be certified, the local manufacturer needs to demonstrate that the delivery timeline risk is manageable and the project will be bankable for the EPC contractor. Factors that influence the delivery timeline risk and bankability of the project include:

— capacity – ability to meet the throughput required
— quality
— ability to support operation and maintenance in the long term
— ability to provide performance guarantees
— ability to meet design requirements, noting that the design requirements will differ by original equipment manufacturer (OEM)

— ability to meet AEMO's technical requirements, noting that only a small number of manufacturers are currently able to meet these for some components

— demonstrated experience.

Once a final investment decision has been made to invest in new local facilities, stakeholders consulted estimated it would take 12-18 months to establish local manufacturing facilities in a pre-existing factory.

As a consequence, there is a significant lag from the time that a clear signal to invest in local facilities is provided to the inclusion of locally manufactured products in projects.[7]

Recommendations for assessing the actual costs and benefits

Economic modelling has been undertaken on an ex ante basis for this project to estimate the economic benefits associated with potential local content requirements, with the costs estimated using a range of assumptions.

The actual costs and benefits of potential local content requirements during the development phase could similarly be estimated by using actual data provided by parties that enter into a contract and then conducting economic modelling on an ex post basis at the completion of the development phase.[8] The economic modelling would assess the difference between:

— a base case, which provides the counterfactual in the absence of additional local content requirements

— an actual case, which is based on the actual expenditure and employment during the development phase.

The ex post economic modelling would need to consider the projects supported through the contract as well as any new or expanded local assembly or manufacturing. The data requirements for this economic modelling are discussed in section 8.6.

Additional scenario following consultation

Following consultation with the Renewable Energy Sector Board and its members on the modest and ambitious local content scenarios, an additional scenario was modelled – this is referred to as the minimum requirements local content scenario.[9] The minimum requirements local content scenario is similar to the modest local content scenario, with a reduction in local content to take into consideration the lag time that would have otherwise been occurred to establish the new facilities required to increase the local content. The key differences are a reduction in the local content for wind towers and transmission towers, which are used for network augmentation and the connection assets for each generation technology.

The estimated local content associated with the minimum requirements local content scenario is set out in Table ES 11.

[7] The lag period will vary by technology, but includes the time to provide a clear investment signal, the time for investors to commit to investing in new local facilities, the time to establish new local facilities, the time to pre-qualify with EPCs, the time for the EPC to tender for a project and then the delivery of the locally manufactured products and projects.

[8] Similar modelling could also be done after the tender stage based on the tendered costs and could also consider the costs and benefits associated with the operational and maintenance phase.

[9] This scenario aligns with the minimum requirements in the Renewable Energy Sector Board's Plan.

Table ES 11 Estimated local content for the minimum requirements local content scenario, by technology

Technology	Development phase	Operating and maintenance phase
Generation, storage and firming technologies (including connection assets)		
Wind	40%	51%
Large scale solar PV	49%	71%
Pumped hydro (8 hours)	66%	61%
Battery storage	23%	35%
Network augmentation		
Transmission	68%	78%

Note: Local materials, labour and indirect costs as a proportion of total costs

Source: ACIL Allen assumptions

The reduction in local content in the minimum requirements local content scenario relative to the modest local content scenario reduces the impact on retail electricity bills, with the weighted average increase reducing from 0.6 per cent under the modest local content scenario to 0.4 per cent under the minimum requirements local content scenario.

The economic impact of the minimum requirements local content scenario is compared to the economic impact of the modest local content scenario in Table ES 12. The projected increase in real economic output and real income is marginally lower under the minimum requirements local content scenario than under the modest local content scenario, while the number of job years is marginally higher, both for Australia and New South Wales.

The marginal reduction in real economic output and real income is due to the lower level of local investment under the minimum requirements local content scenario. The increase in labour costs associated with local content is higher under the minimum requirements local content scenario than under the modest local content scenario and hence the real wage rate drives slightly higher additional labour supply.

Table ES 12 Projected economic impact of local content scenarios (in 2021 dollars)

	Modest local content scenario	Minimum requirements local content scenario
Projected increase in real economic output		
Australia	$200 million	$178 million
New South Wales	$544 million	$520 million
Projected increase in real income		
Australia	$2,146 million	$2,019 million
New South Wales	$2,094 million	$1,949 million
Projected increase in job years		
Australia	19,185 job years	19,215 job years
New South Wales	13,236 job years	13,382 job years

Note: Net present value using a discount rate of 7 per cent

Source: ACIL Allen analysis

1 Introduction

In 2020 the NSW Parliament passed the *Electricity Infrastructure Investment Act 2020* (the Act). The purpose of the Act is to co-ordinate investment in new generation, storage and network infrastructure in NSW. The Act gives effect to the NSW Government's Electricity Infrastructure Roadmap (the Roadmap), which sets out the policy framework for investment to modernise the NSW electricity system into one that is cheaper, cleaner and more reliable.

The Act provides for the establishment of a number of bodies to facilitate the appropriate balancing of its objectives, including the Renewable Energy Sector Board and the Consumer Trustee.

A Renewable Energy Sector Board (Board) was established by the NSW Minister for Energy and Environment in February 2021 under section 7 of the Act. The Board has been drawn from a cross-section of the state's energy stakeholders, including unions, energy consumer advocates, large energy users and representatives of energy market participants.

The Board is required to prepare and provide to the Minister a plan which sets out how to cost effectively achieve the following objectives, in the construction of generation, storage and network infrastructure as required by the Act and associated Regulations:

— to maximise the use of locally produced and supplied goods and services
— to maximise the employment of suitable qualified local workers
— to foster opportunities for apprentices and trainees
— to protect the financial interests of NSW electricity customers
— to be consistent with Australia's international trade obligations.[10]

The Minister may only approve the plan on the recommendation of the Regulator (the Independent Pricing and Regulatory Tribunal (IPART)), and the Regulator may only recommend a plan to the Minister if satisfied that it protects the financial interests of NSW electricity customers and is consistent with Australia's international trade obligations.[11]

In July 2021, AEMO Services Ltd[12] was appointed as the Consumer Trustee under section 60 of the Act. The Consumer Trustee will:

— oversee coordinated planning and investment in electricity generation, storage and transmission in NSW
— authorise electricity network infrastructure projects
— administer tenders to identify the best generation and storage projects for consumers

[10] *Electricity Infrastructure Investment Act 2020*, section 8(1); Electricity Infrastructure Investment Regulation 2021, regulation 5

[11] *Electricity Infrastructure Investment Act 2020*, sections 8(3) and (4).

[12] AEMO Services Ltd is a subsidiary of the Australian Energy Market Operator (AEMO).

— design long term energy service agreements (LTESAs) to encourage new generation and storage investments.[13]

The Consumer Trustee will act independently in the long-term interests of NSW electricity customers.[14] It will not be subject to the control or direction of the Minister[15], but must take into account the plan in the exercise of its functions.[16]

The Board, through the plan, will provide advice to the Consumer Trustee on how to maximise the use of local content in the LTESA tender rules.

The Department of Planning and Environment (the Department) engaged ACIL Allen to undertake modelling on the costs and benefits associated with possible minimum requirements for local content, as well as a survey of NSW electricity customers' willingness to pay for the broader benefits associated with local content requirements. This modelling and analysis will inform the Board's plan and the Regulator's consideration of the plan.

This report describes the modelling and analysis that has been undertaken, presents the results from that modelling and analysis, and makes recommendations on assessing the costs and benefits after the construction phase. This report is structured as follows:

— Chapter 2 outlines the methodology, scenarios and assumptions for modelling the costs and benefits of possible minimum requirements for local content.
— Chapter 3 draws on the assumptions described in chapter 2 to summarise the key inputs to the economic impact modelling.
— Chapter 4 outlines the economic impact of the local content scenarios.
— Other potential positive and negative impacts associated with the local content scenarios are described qualitatively in chapter 5.
— Chapter 6 describes some practical considerations associated with the local content scenarios based on consultations with developers and engineering, procurement and construction (EPC) contractors.
— The results from customer research, including the estimated willingness by NSW electricity customers to pay for increased local content, are provided in chapter 7.
— The conclusions and recommendations for assessing the actual costs and benefits after the construction phase are provided in chapter 8.
— An additional scenario was modelled following consultation with the Renewable Energy Sector Board and its members. The assumptions and results from the modelling of this additional scenario are provided in chapter 9.

[13] https://www.environment.nsw.gov.au/news/new-electricity-consumer-trustee-to-put-energy-consumers-first, Media Release issued 23 July 2021

[14] *Electricity Infrastructure Investment Act 2020*, section 60(3)

[15] *Electricity Infrastructure Investment Act 2020*, section 60(5)

[16] *Electricity Infrastructure Investment Act 2020*, section 9(1)

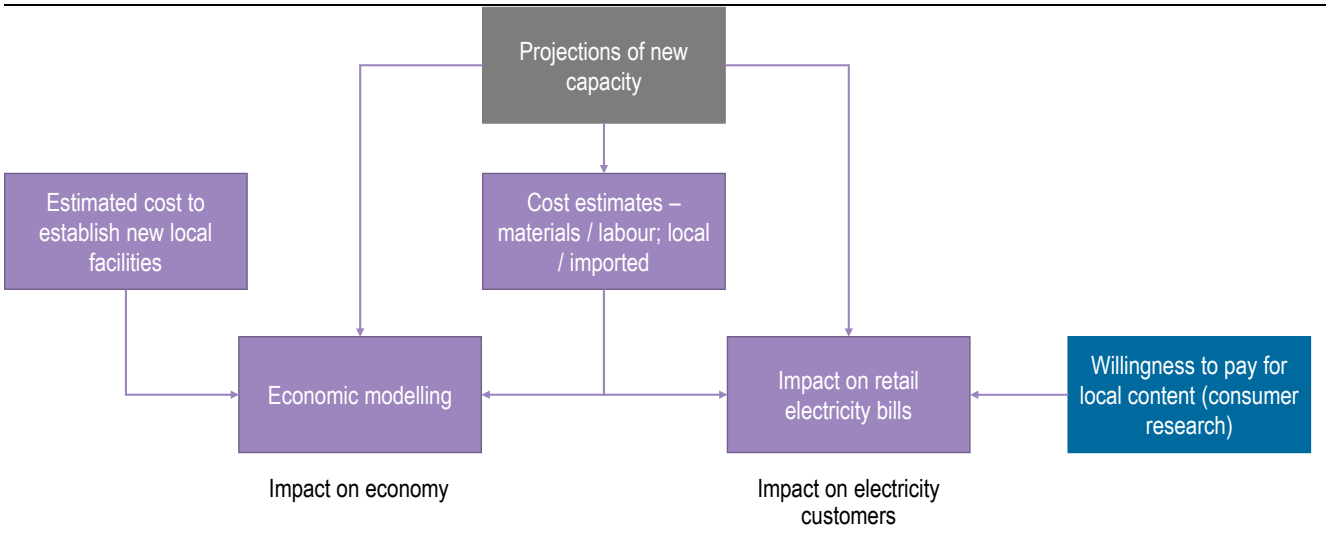
Methodology, scenarios and assumptions 2

This chapter outlines the methodology, scenarios and assumptions for modelling the costs and benefits of possible minimum requirements for local content.

An overview of the methodology is provided in Figure 2.1. It comprises the following elements:

1. projections of new capacity, which project the amount of new generation and network capacity to be installed to 2040-41
2. cost estimates which, for each technology projected to be deployed, provide a breakdown of the costs by material and labour and by local and imported content
3. cost to establish new facilities, which are the estimated costs to establish new facilities for local assembly or local manufacture to facilitate meeting the possible local content requirements
4. economic modelling, which estimates the impact on the economy and jobs of the possible minimum local content requirements using Input-Output (IO) and Computable General Equilibrium (CGE) models
5. retail electricity bills, which estimates the impact of the possible local content requirements on the retail electricity bills of NSW electricity customers
6. willingness to pay, which is consumer research to estimate the amount that NSW electricity customers are prepared to pay to increase local content.

Figure 2.1 Overview of the methodology for modelling the costs and benefits of possible minimum requirements for local content



Source: ACIL Allen

Our approach to complete each of these elements is discussed in more detail in the sections below. We have also included a section outlining key definitions in the analysis.

Our approach requires us to make a range of assumptions to estimate the costs associated with local content, which are described in this chapter. Given the uncertainty associated with these assumptions, we have tended to make, what we considered to be, more conservative assumptions. For example, we included cost premia that are biased higher rather than lower and not assumed that imported labour used for installation during the development phase will be substituted with local labour.

2.1 Key definitions

Local content

For the purposes of this project, local content refers to content from Australia and New Zealand.

Short, medium and long term

Although there is not a set definition for these commonly used terms, many consider anything less than two years to be short-term, three to seven years as medium term and anything more than seven years to be long term.

In the context of economic modelling, in particular general equilibrium modelling, these terms are commonly used to define the assumptions regarding the economic environment. CGE models can be run using a variety of assumptions that determine how the modelled economy responds to change. These assumptions are known as the 'closure'. The closure determines which variables are determined endogenously (within the model) and which are determined exogenously (outside the model). The choice of closure can significantly influence the results of any modelling exercises.

In CGE models, a long-term closure models a long-run equilibrium. In the long-run, economic agents optimise, all markets are in equilibrium, and assets and liabilities follow sustainable paths. Some of the key assumptions involved in the long-term closure are profit maximisation, labour

market equilibrium[17], a sustainable external balance, a sustainable government budget balance and sustainable private savings. The long-term closure also factors in full adjustment of industry capital stocks to economic shocks.

In contrast, short term closures hold industry capital stocks fixed but labour is mobile.

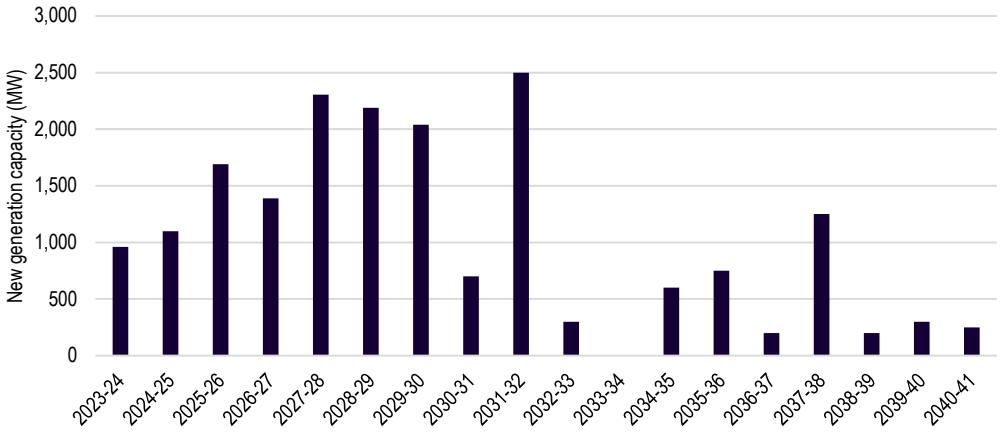
In the context of the Roadmap, the application of a long term closure is more appropriate as it is a long-term initiative spanning a period of more than seven years.

2.2 Projections of new capacity

The Department provided an indicative projection of the new electricity infrastructure to be built over the period from 2023-24 to 2040-41, which has been used as the basis for the economic modelling.

The new generation capacity projected to be installed during this period is illustrated in Figure 2.2. Most of the new projected generation capacity (79 per cent) is built in the period to 2031-32.

Figure 2.2 Projected indicative new generation capacity, FY24 to FY41



Source: ACIL Allen based on Department's modelling

The Department advised five network projects that are projected to be built to accommodate the new generation capacity, a high level overview of which are provided in Table 2.1.

Table 2.1 Expected network augmentation projects

Project	Timing
Central West Orana REZ, including new 500 kV lines, 500 / 330 kV transformers and three new substations	1/7/2024
South West NSW stability improvement, including a new 330 kV line	1/7/2024
New England REZ, including new 500 kV lines, 500 / 330 kV transformers and two new substations	1/7/2027
Queensland-New South Wales interconnector, including new 500 kV lines and a new substation	1/7/2027
Sydney ring 500kV north and south paths. Including new 500 kV and 330 kV lines, 500 / 330 kV transformers and a new substation	1/7/2027

[17] Additional details about the standard Tasman Global labour market assumptions are provided in Appendix D.

Project	Timing

Source: ACIL Allen based on information provided by the Department

The outcomes of the modelling and analysis will be different if different projections of new generation capacity and network augmentations are assumed.

2.3 Cost estimation

A key input to this project is a detailed understanding of the local versus imported content for each of the technologies that are likely to be built to modernise the NSW electricity system, without any minimum local content requirements.

The capital cost estimates for each of these technologies were developed by WT Partnership. The cost breakdowns distinguish between materials and labour and indicate, with no minimum requirements for local content (i.e. under the baseline), which components would be:

- imported
- imported, but could be sourced locally for an additional cost
- sourced locally:
  - from New South Wales
  - from other regions of Australia
  - from New Zealand.

Where components would be imported with no minimum requirements for local content, but could be sourced locally for an additional cost, the additional cost for local sourcing of each of those components was estimated.

The locally sourced components were segregated into New South Wales, other regions of Australia and New Zealand to enable the data to be input into the economic model in that way. We used our judgement to assume the source of local labour costs to be 70 per cent in New South Wales and 30 per cent in the rest of Australia. The source of local materials costs has been assumed based on the location of existing manufacturing facilities[18] and forming a view as to whether these existing facilities would be used or whether new facilities would be established.

The developed cost estimates are at a conceptual level of detail and definition, with an expected accuracy of Class 5[19] and were derived from WT Partnership's database of previous projects. The estimates were structured using primarily historic and unit rates, with these being validated using first principles rates (assessing the labour, plant and materials required to carry out the works) to ensure their appropriateness for the works wherever possible, and to allocate resources as local or imported.

Indirect costs and contingencies for the estimates are deterministic, i.e. percentages added to the total.

Additional details about the cost estimation methodologies for new generation capacity and network augmentations are provided below.

[18] For example, existing facilities for fabricating wind towers and manufacturing transformers in Victoria

[19] Class 5 estimates are used where there is low level of project definition for concept screening. The expected accuracy range is -20% to -50% on the low side and +30% to +100% on the high side. By way of comparison, Class 4 estimates are used for feasibility studies when there is a higher level of project definition.

2.3.1 Generation and storage capital cost estimates

A capital cost breakdown has been provided for the following technologies (refer Table B.1):

— large scale solar PV

— wind

— pumped hydro storage (8 hours +)

— battery storage

— plus the cost of connection assets.

For the purposes of the analysis, we have assumed that:

— a large scale solar PV has a of capacity 100 MW

— a wind farm has a capacity of 100 MW

— pumped hydro storage has a capacity of 250 MW

— battery storage has a capacity of 300 MW / 450 MWh.

The total costs, with no minimum requirements for local content, have been reconciled against the following cost assumptions that are used by the Australian Energy Market Operator (AEMO):

1. Large scale solar PV - $1,408 per kW in 2021-22
2. Wind - $2,006 per kW in 2021-22
3. Pumped hydro (8 hours +) - $2,520 per kW in 2021-22
4. Battery storage (1.5 hours) - $919 per kW in 2021-22[20]
5. Connection assets - $132.50 per kW for a 10 km, 330kV, 400 MW connection and $102.50 per kW for a 5 km, 330 kV, 400 MW connection.[21]

Cost reductions over time

AEMO projects that the costs of:

— wind generation will decrease in real terms by around 0.6 per cent per year

— large scale solar PV will decrease in real terms by 7.4 per cent from 2021-22 to 2022-23, by 4.2 per cent from 2022-23 to 2023-24, with the annual cost reduction reducing over time to around 2 per cent per year by 2032-22

— pumped hydro storage (8 hours+) will decrease in real terms by around 0.2 per cent per year

— battery storage will decrease in real terms by around 3 per cent per year.

These cost reductions have been applied to the cost estimates for 2021-22.

Regional cost factors

The costs of the generation technologies vary by location. AEMO has determined "regional cost factors" which have been applied to WT Partnerships' cost estimates as appropriate, based on the indicative locations of new capacity. Regional cost factors have not been applied to pumped hydro storage as no indicative locations were provided.

The regional cost factors that have been used are set out in Table 2.2.

[20] Based on the line of best fit for the costs of 1, 2, 4 and 8 hour battery storage

[21] AEMO, 2021 Inputs and assumptions workbook.

Table 2.2 Regional cost factors

Technology	Location	Cost zone	Cost factor
Wind	New England	Low	100%
	Central West Orana Wagga Wagga Cooma-Monaro	Medium	106.2%
	South West NSW	High	112.4%
Large scale solar PV	New England	Low	100%
	North West NSW Central West Orana	Medium	106.7%
	South West NSW	High	113.3%
Battery storage (1.5 hours)[22]	New England	Low	100%
	North West NSW Central West Orana	Medium	105.4%
	South West NSW	High	110.8%

Source: AEMO, 2021 Inputs and assumptions workbook

In applying these regional cost factors, we referred to the more detailed breakdown of regional cost factors as set out in Table 2.3.

Table 2.3 Regional cost factor by type of cost

Region	Equipment costs	Fuel connection costs	Cost of land and development	Installation costs	O&M costs
NSW low	1.00	1.00	1.00	1.00	1.00
NSW medium	1.05	1.07	1.00	1.10	1.08
NSW high	1.10	1.16	1.00	1.20	1.17

Source: AEMO, 2021 Inputs and assumptions workbook

2.3.2 Transmission network capital cost estimates

There are projected to be a number of transmission network upgrades that will be required to accommodate the projected new generation capacity, as set out in Table 2.1. We estimated the composition of each of these upgrades based on information provided by the Department and published by AEMO, by reconciling the total project costs to AEMO's indicative costs for components. The estimated composition is set out in Table A.1 in Appendix A.

WT Partnership provided a cost breakdown of the following components of the transmission network upgrades. AEMO's indicative cost estimates in 2019 dollars are provided below.

- Transmission line:
  - 500 kV double circuit (3040 MVA each) - $2.47 million / km
  - 500 kV double circuit (3020 MVA) - $2.06 million / km
  - 330 kV double circuit (1200 MVA each) - $1.93 million / km
  - 330 kV single circuit (1200 MVA) - $1.54 million / km
- 500/330 kV 1000 MVA transformer - $20.5 million
- Circuit breakers

[22] Cost factors averaged for 1 hour and 2 hours battery storage

- 3 CB diameter 3CBs – 500 kV - $11.22 million
- 3 CB diameter 2CBs – 500 kV - $8.76 million
- 3 CB diameter 3CBs – 330 kV - $7.51 million
- 3 CB diameter 2CBs – 330 kV - $5.79 million

— Substations
- New substation establishment (10,000m^2) - $16.18 million
- New substation establishment (20,000m^2) - $23.43 million
- New substation establishment (30,000m^2)[23] - $31.53 million.

WT Partnership also provided a breakdown of costs for a 500 MVA and a 1,500 MVA 500 / 330 kV transformer.[24]

2.3.3 Impact of local manufacture on costs over time

The hypothesis is that the cost of locally manufactured materials and local labour will decrease over time with a minimum local content requirement (essentially a mix of learning-by-doing and economies of scale efficiency improvements).

We considered the extent to which cost efficiencies may be realised over time with an increase in local content. There are already significant annual cost efficiencies incorporated in the base case costs associated with the generation technologies and therefore we did not include any additional cost efficiencies.

We did not include any cost efficiencies for the transmission network upgrade projects as these would not be material to the analysis.

2.3.4 Operating and maintenance cost assumptions

There are operating and maintenance costs associated with the projected new generation and storage capacity and the network augmentations. The operating and maintenance costs for the generation and storage options are from AEMO's 2021 Inputs and assumptions report, and operating costs for the network augmentation options and the split between materials and labour are based on previous modelling undertaken by ACIL Allen. The splits between materials and labour have then been adjusted for each cost zone using the regional cost factors for equipment (materials) and installation (labour) as set out in Table 2.3.

The operating and maintenance costs used in the economic modelling are set out in Table 2.4. The breakdown of the materials (which includes materials and labour) by local and imported is the same as that assumed for the capital expenditure, while the labour component is assumed to be local.

Table 2.4 Operating and maintenance cost estimates for the base case

Technology	Cost zone	Fixed O&M	Materials	Labour
		$ per kW per annum	% of O&M	% of O&M
Wind	Low	$25.92	89%	11%
	Medium	$27.98	89%	11%
	High	$30.28	88%	12%
Large scale solar PV	Low	$17.61	26%	74%
	Medium	$19.02	25%	75%

[23] New substation establishment includes earth works, secondary systems building, DC supply, AC supply auxiliary transformers/cabling, fire protection and communication systems.

[24] AEMO's Inputs and assumptions workbook includes the cost for a 1,000 MVA transformer but not a 500 MVA or a 1,500 MVA transformer.

Technology	Cost zone	Fixed O&M	Materials	Labour
	High	$20.58	24%	76%
Pumped hydro (8 hours)	All	$16.79	38%	62%
Battery storage (1.5 hours)	Low	$8.88	80%	20%
	Medium	$9.58	80%	20%
	High	$10.37	80%	20%
Network augmentation	All	2% of capex	67%	33%

Source: AEMO's 2021 Inputs and assumptions report; ACIL Allen based on previous modelling

2.4 Economic modelling

The economic modelling included consideration of the following:

- scenario design
- data gathering and development of modelling inputs
- choice of the modelling framework for the analysis
- economic impact modelling
- analysis of other costs and benefits.

Each of these is described in more detail in the sections below.

2.4.1 Scenario design

Based on our discussions with the Department, we analysed the following local content scenarios:

- *Base case scenario (or reference case)* — the business as usual (least cost) case where it is assumed that there are no minimum local content requirements. The base case scenario is used as a benchmark with which to compare the results of simulating various change scenarios.
- *Modest local content scenario* — the case where there is a modest level of local content.
- *Ambitious local content scenario* — the case where there is an ambitious level of local content.[25]

Base case local content scenario

The base case local content scenario used the baseline cost estimates provided by WT Partnership, with the application of regional cost factors and cost reductions over time, as appropriate.

There are some components that would be sourced locally, regardless of short-term market conditions, because it would not be competitive to source them internationally. These are included as local content in the base case. There are other components that would be imported due to the absence of local capability. These are not included as local content in the base case.

Finally, there are components that could be locally manufactured or could be imported based on pricing at the time a contract is awarded, which is dependent on the state of the market for that component – which is influenced by whether there are local capacity constraints, the exchange rate, the pricing for sourcing from other countries, and whether there are any anti-dumping

[25] This scenario aligns with the stretch goals in the Renewable Energy Sector Board's Plan.

measures in place. For the purposes of this scenario, these components are assumed to be imported in the base case local content scenario.

Accordingly, the base case represents a floor on the amount of competitively sourced local content that would be delivered in a competitive market environment in the absence of any policy. This is expected to be stable in the short term (two years).

In relation to labour requirements, the base case local content scenario assumes:

- Employment, skills and knowledge transfer:
  - the NSW Government Infrastructure Skills Legacy Program (ISLP) minimum requirements are not met by tenderers
  - there are no self-nominated targets
  - there are no stretch goals during the Value for Money (VFM) stage
- Opportunities for First Nations:
  - the NSW Government Aboriginal Procurement Policy (APP) minimum requirements are not met by tenderers
  - there are no self-nominated targets
  - there are no stretch goals during the VFM stage.

A range of assumptions have been made on a more detailed breakdown of the costs. These assumptions are detailed in Appendix B and have been informed by:

- information provided by WT Partnership
- a July 2021 report prepared for the Department by the Institute for Sustainable Futures and SGS Economics and Planning, *Employment Skills and Supply Chains: Renewable Energy in NSW – Progress Report*
- a September 2021 report prepared for the Department by the MBB Group, *Supply Chain Analysis Report, NSW Electricity Infrastructure*.

The two reports prepared for the Department included significant stakeholder consultation.

Stakeholders consulted for this project indicated that the assumptions that have been made are generally reasonable.

Modest local content scenario

As discussed above, there are some components that could be locally manufactured or could be imported based on the state of the market for that component. These components are assumed to be locally manufactured or assembled for the purposes of the modest local content scenario. When making these assumptions, we took into account the capacity of small and medium-sized enterprises (SMEs) in Australia and New Zealand to deliver the materials required, as discussed below.

It has been assumed that a cost premium applies where components are locally manufactured or assembled rather than imported. The cost premia that have been assumed for substituting imported content with local content, which are detailed in Appendix B, are based on:

- information provided by WT Partnership
- the detailed cost breakdowns derived for the base case
- assuming that higher cost increases generally apply as the labour proportion of the costs increases.

Given the uncertainty associated with the cost premia, a conservative approach has been adopted for the purposes of the modelling – the cost premia are generally biased higher rather than lower.

While some stakeholders consulted for this project indicated that the assumptions made are reasonable, others indicated the cost premia are likely to be on the high side.

As discussed in section 2.4.2, some new facilities would need to be developed to deliver the local content required for the modest local content scenario. There is a lead time required to establish these facilities. Accordingly, from a practical perspective, the modest local content scenario is not achievable in the short term, but could be achievable in at least two years' time.

In relation to labour requirements, the modest local content scenario assumes:

- Employment, skills and knowledge transfer:
  - minimum requirements for learning workers and minimum requirements for apprentices are met (20 per cent of total workforce)
  - there are no self-nominated targets for local jobs
  - there are no stretch goals for local jobs during the VFM stage
- Opportunities for First Nations:
  - the minimum requirements for percentage of the project value to be directed towards First Nations are met (1.5 per cent of project value)
  - there are no self-nominated targets for First Nations jobs or subcontracting
  - there are no stretch goals for First Nations jobs or subcontracting during the VFM stage.

It has been assumed that these labour requirements will increase local labour costs by 2 per cent. This increase has been conservatively estimated by assuming:

- 20 per cent of the workforce are apprentices and trainees
- apprentices and trainees are paid approximately 50 per cent of the full wage rate
- on average, employers would pay apprentices and trainees for half a day a week for training
- the cost of training fees, books and tools is approximately one quarter of the labour cost for training
- a modest increase in cost for greater contribution by First Peoples to cover training requirements.

Stakeholders consulted for this project were of the view that the assumption made was reasonable.

We have not assumed that imported labour for installation during the development phase is substituted with local labour, as it has been assumed that the imported labour is generally highly skilled and specialised.

Ambitious local content scenario

The cost estimates for the ambitious local content scenario are based on the baseline cost estimate but with imported content replaced with local manufacture or assembly where we have assumed that the projected quantities for that component could justify establishing a local presence. When making these assumptions, we recognised that this scenario reflected a stretch goal – an ambition to be able to grow the capability and capacity of SMEs in Australia and New Zealand to deliver the materials required to meet the future needs of the energy sector.

It has been assumed that a cost premium applies where components are locally manufactured or assembled rather than imported. The assumptions underpinning the cost premia assumed for local manufacture or local assembly are detailed in Appendix B.

As with the modest local content scenario, given the uncertainty associated with the cost premia, a conservative approach has been adopted for the purposes of the modelling – the cost premia are generally biased higher rather than lower. That said, the Clean Energy Council was of the view that

two of the cost premia assumed in the ambitious local content scenario were too low. It was of the view that the cost premia for locally manufactured:

— blades for wind turbines should be 100 per cent rather than 30 per cent

— transmission towers should be 60 per cent rather than no cost premium.

As discussed in section 2.4.2, some new facilities would need to be developed to deliver the local content required for the ambitious local content scenario. There is a lead time required to establish these facilities. Accordingly, from a practical perspective, the ambitious local content scenario is not achievable in the short term.

In relation to labour requirements, the ambitious local content scenario assumes:

— Employment, skills and knowledge transfer:
  — minimum requirements for learning workers and minimum requirements for apprentices are met (20 per cent of total workforce)
  — self-nominated targets and stretch goals for local jobs are met
— Opportunities for First Nations:
  — the minimum requirements for percentage of the project value to be directed towards First Nations are met (1.5 per cent of project value)
  — self-nominated targets and stretch goals for First Nations jobs or subcontracting are met.

As the ambitious local content scenario is based on (unspecified) self-nominated targets and stretch goals, it has been assumed that the additional cost to meet these requirements is more than double the percentage for the modest local content scenario. That is, it has been assumed that these labour requirements will increase local labour costs by 5 per cent.

We have not assumed that imported labour for installation during the development phase is substituted with local labour, as it has been assumed that the imported labour is generally highly skilled and specialised.

Summary of labour assumptions

The labour assumptions for each local content scenario are summarised in Table 2.5.

Table 2.5 Labour assumptions, by scenario

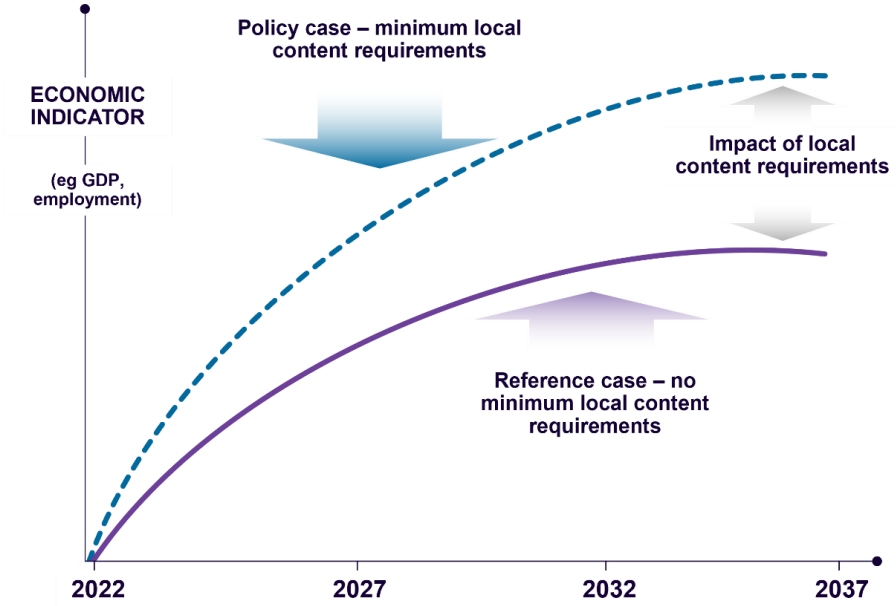
	Infrastructure Skills Legacy Program	First Nations
Base case	Minimum requirements not met No self-nominated targets No stretch goals during the VFM stage	Minimum requirements not met No self-nominated targets No stretch goals during the VFM stage
Modest local content scenario	Minimum requirements met (20 per cent of total workforce) No self-nominated targets No stretch goals during the VFM stage	Minimum requirements met (1.5 per cent of project value) No self-nominated targets No stretch goals during the VFM stage
Ambitious local content scenario	Minimum requirements met (20 per cent of total workforce) Self-nominated targets and stretch goals are met	Minimum requirements met (1.5 per cent of project value) Self-nominated targets and stretch goals are met

Source: ACIL Allen

Assessing the impact of the local content scenarios

The difference between the base case and local content scenarios allowed us to quantify the impacts of the increases in local content on the economy. This principle is depicted in Figure 2.3.

Figure 2.3 Illustrative scenario using a CGE model of the Australian economy



Source: ACIL Allen.

To cover the project requirements to analyse the broader economic benefits of the electricity infrastructure investment and the costs and benefits of local content requirements after the construction phase, the economic modelling analysed the impacts of two separate phases:

— *the construction or development phase* — the analysis of this phase focused upon the economic impact of the capital expenditure and development activities of the projects. The main economic impact of construction in a region is to increase demand, a proportion of which inevitably leaks out to other regions (and to imports). The construction phase will take place over a relatively short period and the economic impacts of the construction activity itself are not expected to have lasting long term impacts on the economy

— *the operational phase* — the analysis of this phase looked at what happens in a typical year in the future when the infrastructure facilities are providing service. It reflects the expected or average change in the medium to longer term when all of the various changes have fully worked their way through the economic system. The operational phase is where any pass-through to customers of the costs from the local content requirements will happen.

In each of these phases we accounted for both the costs and the broader benefits of the local content requirements.

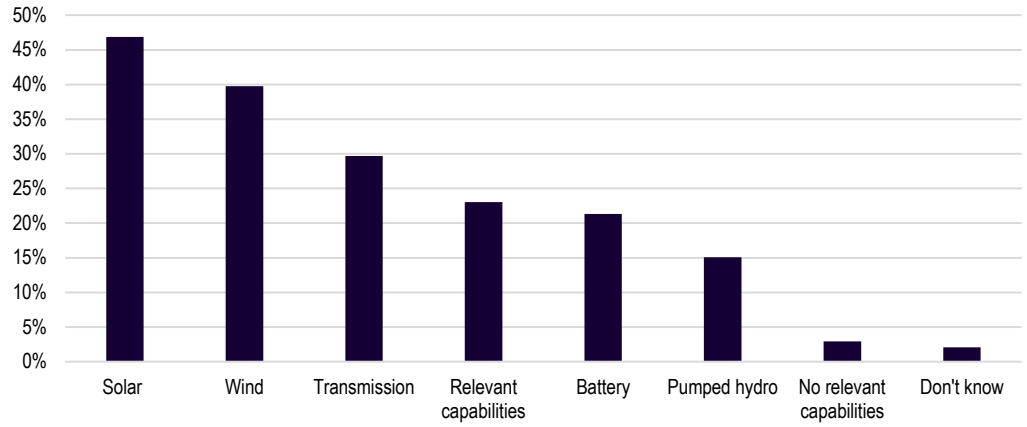
Assessing the capability of SMEs to deliver the materials required

The Department engaged the Institute for Sustainable Futures (ISF) at the University of Technology Sydney and SGS Economics and Planning (SGS) to undertake a study to identify, scope and assess the local supply chain capacity to develop the infrastructure required to modernise the NSW

electricity system. As part of that engagement, ISF and SGS surveyed 239 businesses in New South Wales. Of the 216 businesses that provided the number of employees, 86.1 per cent were SMEs.

The businesses were surveyed on their relevant experience (refer Figure 2.4). Nearly 50 per cent of the respondents had experience with solar farms, 40 per cent had experience with wind farms, 30 per cent with transmission infrastructure, 21 per cent with battery storage and 15 per cent with pumped hydro storage. In addition, 23 per cent of the businesses indicated they did not have any experience in the energy sector but had relevant capabilities. Only 3 per cent of respondents had no experience or relevant capabilities and 2 per cent responded that they did not know.

Figure 2.4 Relevant experience by NSW businesses surveyed



Source: ACIL Allen based on survey by ISF and SGS

The Australian Bureau of Statistics (ABS) reports on the number of businesses by state by ANZSIC Industry Code. The number of SMEs operating in industries that may be relevant to modernising the NSW electricity system are set out in Table 2.6. This data indicates that there are over 1,000 SMEs in New South that could contribute to modernising the NSW electricity system. The number of businesses is much higher if other Australian states and territories and New Zealand are also taken into consideration.

Table 2.6 Number of SMEs in NSW in related industries, 30 June 2021

ANZSIC Industry Code	ANZSIC Industry label	Number of SMEs at 30 June 2021
2110	Iron smelting and steel manufacturing	215
2121	Iron and steel casting	27
2122	Steel pipe and tube manufacturing	35
2210	Iron and steel forging	24
2221	Structural steel fabricating	430
2240	Sheet metal product manufacturing (except metal structural and container)	217
2439	Other electrical equipment manufacturing	207
Total		1,155

Source: ACIL Allen based on ABS 8165.0 Counts of Australian Businesses, including Entries and Exits, June 2017 to June 2021

Steel requirements

The steel requirements for each local content scenario were considered by reference to the capacity of SMEs to deliver the capacity required. The steel requirements focused on the most steel intensive components, such as:

- wind towers
- racking and mounting for solar farms
- civil and structural works for substations.

The steel requirements did not include the steel components integral to a component or product that is not available locally, for example, the steel component of the imported transformers.

The steel requirements were assumed to be imported in the base case and local in the modest and ambitious local content scenarios.

2.4.2 Data gathering and development of modelling inputs

Relevant data and information required to analyse the economic impact of the alternative local content scenarios was collected and analysed. In broad terms, the data required for the economic impact analysis can be broken down into two categories as explained in the sections below.

Data related to the local content scenarios

The inputs to the economic modelling relating to the local content scenarios include:

- a time profile of the capital and operating expenditure for each technology under each scenario:
  - the date of commencement was taken from the projections of new capacity provided to us by the Department
  - the capital cost profile is based on the lead time for each technology as set out in Table 2.7
  - the operating and maintenance costs will be incurred annually for the economic life of the technology as set out in Table 2.7
- construction and operating phase employment and employment payments for each scenario:
  - are based on the labour cost estimates provided by WT Partnership and average wage rates

— any additional investment expected to be undertaken outside the supply chain inputs as part of the minimum local content requirements (e.g. investment in capacity building initiatives)

— wholesale electricity prices — these were provided to 2041-42 by the Department

— the impact of the local content scenarios on retail electricity prices, which will be based on:
  — the pass through of any additional costs to customers with costs passed through on an annual basis over 20 years (generation and storage)[26] and over 50 years for the network augmentation projects[27]
  — costs being estimated using a building block approach (return on capital, return of capital and operating costs)
  — transmission-connected customers being exempt and emissions-intensive trade exposed distribution-connected customers being partially exempt from the additional costs.[28]

Table 2.7 Time profile of the capital and operating expenditure

Technology	Capital expenditure profile	Operating and maintenance expenditure profile
Wind	70% in year t-1 20% in year t-2 10% in year t-3	Annually for 25 years
Large scale PV	80% in year t-1 20% in year t-2	Annually for 25 years
Pumped hydro (8 hours)	33% in year t-1 27% in year t-2 20% in year t-3 10% in year t-4 10% in year t-5	Annually for 40 years
Battery storage	100% in year t-1	Annually for 20 years
Connection costs	80% in year t-1 20% in year t-2	Annually for 50 years
Network augmentation	80% in year t-1 20% in year t-2	Annually for 50 years

Note: year t is the year in which the technology commences operation

Source: ACIL Allen based on AEMO's 2021 Input and assumptions workbook, Aurecon, 2020 Costs and Technical Parameter Review, Consultation Report, Revision 4, 2021-03-19; Entura, Pumped Hydro Cost Modelling, 7 December 2018; ACIL Allen based on previous modelling

The economic modelling was undertaken over a period to 2040-41. The operating and maintenance costs extend beyond this period as well as the impact on electricity prices. However, as we did not have the projected wholesale electricity prices beyond this period, we have not extended the economic modelling beyond 2040-41.

Capacity building initiatives

The new facilities that are assumed to be developed under the modest and ambitious local content scenarios to manufacture and assemble components locally are set out in Table 2.8.

[26] As indicated by NSW Government, *Long-Term Energy Service Agreement Design, Consultation Paper*, August 2021, page 1.

[27] As implied by the assumed economic life and section 38(2) of the Act.

[28] The Act only provides for the costs associated with LTESAs to be recovered from distribution-connected customers, not transmission-connected customers. It also provides for an exemption regime for emissions-intensive trade exposed customers who are connected to the distribution system.

Table 2.8 New facilities to be developed

Technology	Modest local content scenario	Ambitious local content scenario
Wind	Local assembly of turbines	Local manufacture of turbines
Solar	Nil	Local manufacture of modules
Pumped hydro	Nil	Local manufacture of pumps / turbines
Transmission lines	Local manufacture of towers	Local manufacture of towers and conductors

Source: ACIL Allen assumptions

The costs associated with the new facilities incorporate the costs of land, the building shell and the fitout (including specialised equipment) for that building. It has been assumed that for each new facility established:

- the cost for land in regional NSW is in the order of $100,000[29]
- the cost of the building shell is in the order of $400,000[30]
- the fitout (including specialised equipment) is in the order of:
  - $20 million for local assembly of wind turbines, and local manufacture of solar modules, hydro pumps / turbines and transmission line towers
  - $40 million for local manufacture of wind turbines and high voltage conductors.

These costs are highly speculative[31], but are likely to be in the right order of magnitude – one of the stakeholders consulted for the project advised that a mould for a single blade for a wind turbine costs in the order of $20 million, and Vestas invested $9 million to establish a wind turbine blade factory in Victoria in 2005.[32]

The new facilities will need to be established prior to the local manufacture or assembly of components for the new investment. We have assumed that a two year lead time is required, which is broadly consistent with advice from one of the stakeholders consulted for this project. That stakeholder advised that a minimum of 12-18 months would be required following a decision to make the investment.

From a practical perspective, this means that the theoretical local content required for the modest and ambitious local scenarios cannot be delivered in the short term.

Data related to the size and structure of the NSW economy

To undertake the economic modelling, we collected data and information about the size and structure of the NSW economy. We considered:

- data/information on the location of major infrastructure and manufacturing facilities
- data/information on the current and future structure of the manufacturing industries that support renewable projects

[29] Based on the value of industrial land in Armidale. For example the value of 38 Myrtle Drive is $182,000 for 17.38 hectares https://portal.spatial.nsw.gov.au/portal/apps/webappviewer/index.html?id=2536c8e4882140eb957e90090cb0ef97

[30] Based on https://www.centralbuild.com.au/much-cost-build-factory/

[31] Informed by the value of grants provided to companies for manufacturing facilities https://www.premier.vic.gov.au/75m-investment-next-generation-victorian-manufacturing

[32] https://www.windpowermonthly.com/article/960266/vestas-factory-officially-opened-victoria

— data/information on the current and anticipated employment and skills of future manufacturing industries that support renewable projects
— data/information relating to local and domestic component suppliers and companies in the supply chain.

We used this information to develop a profile of the current and future manufacturing industry. This profile was used to demonstrate the impacts that the different local content scenarios could have on the NSW economy and the Australian economy overall.

These data and information was gathered from the following sources:

— existing publicly available publications/research and datasets
— the Australian Bureau of Statistics (ABS)
— information provided by the Department
— our previous work in this space.

After collecting all the data above, we used them to develop the modelling inputs.

Discount rate

Where costs have been discounted in the analysis, the discount rates set out in Table 2.9 have been used. These are consistent with the discount rates used in the projections of new generation capacity and network augmentations, as provided to us by the Department.

Table 2.9 Discount rates

Technology	Real discount rate
Wind	1.84%
Large scale PV	1.49%
Pumped hydro (8 hours)	1.83%
Battery storage	1.68%
Connection costs	As per generation technology
Network augmentation	4%

Source: Department

2.4.3 Choice of modelling framework

The macroeconomic impacts of a policy, project or other activity can be estimated using a variety of economic analysis tools. The most common methods utilised are IO multiplier analysis and CGE modelling. The selection of the right tool is critical to the accuracy of the estimated impacts and depends upon the characteristics of the project and industry. Sometimes a range of tools are required. A short overview of the two modelling techniques and their relative strengths is provided in Box 2.1.

By their nature, IO multipliers and CGE models focus on 'market impacts' across the economy (i.e. impacts on activities with observed market prices). Analysis of various 'non-market impacts', such as property right infringements, potential loss of biodiversity, changes in air quality or greenhouse gas emissions, social justice implications, etc., may also be relevant in assessing the full implications of a project or policy but are not captured within IO multipliers and CGE models.

Fundamentally, although various aspects of a policy or project – such as the number of jobs or the size of the investment expenditure – are of relevance to particular stakeholders, the key aggregate measure of the macroeconomic impact of a project is the extent to which the total income of the economy would be changed as a result of the policy or project. Typically, this is measured by real

Gross National Disposable Income (RGNDI), although real Gross Domestic Product (GDP) and consumer surplus (among others) can also be important aggregate measures depending on the nature of the policy or project being analysed.

The main factors that need to be considered when analysing the macroeconomic impacts of a project or policy include:

- the direct and indirect contribution to the economy as a result of the activities associated with the project
- any crowding out implications as resources are potentially diverted from other productive activities to undertake the project being analysed
- any productivity effects generated as a direct result of the policy or project activities – particularly any enduring productivity changes or productivity impacts on other activities not directly associated with the project or policy
- any changes to the factors of production in the economy
- any implications associated with changes in terms of trade or foreign income transfers
- the extent of any dynamic element to the size of any of the above effects (for example, associated with different phases of the project).

Box 2.1 Overview of IO modelling versus CGE modelling

Input-output (IO) tables are at the heart of both multiplier analysis and CGE models. Input-output tables provide a comprehensive picture of the supply and consumption of all commodities within the economy, including detailed information on factor incomes, taxes and the source (domestic or foreign) of every commodity. They are essentially the bottom-up accounting framework that underlies the calculation of aggregate GDP. Unlike the GDP accounts, however, IO tables retain all intermediate consumption and therefore provide a detailed picture of the structure and interrelationships of industries. An important feature of IO tables is that they are fully balanced matrices. For example, production costs (including returns to factors of production) equals sales revenue.

IO multipliers are summary measures generated from input-output tables that can be used for predicting the total impact on all industries in the economy of changes in demand for the output of any one industry. The tables and multipliers can also be used to measure the relative importance of the product chain linkages to different parts of the economy. In most circumstances, the results of IO multiplier analysis should be treated as upper level impacts.

CGE models mimic the workings of the economy through a system of interdependent behavioural and accounting equations which are linked to an input-output database. These models provide a representation of the whole economy, set in a national and international trading context, starting with individual markets, producers and consumers and building up the system via demands and production from each component. When an economic shock or disturbance is applied to a model, each of the markets adjusts according to the set of behavioural parameters which are underpinned by economic theory. The generalised nature of CGE models enable a much broader range of analysis to be undertaken (generally in a more robust manner) compared to IO multiplier techniques.

Limitations of IO analysis

While IO modelling is valid for understanding the contribution infrastructure investment makes to the economy, it has its limitations. It uses IO tables, which are a snapshot of an economy in a given period. The multipliers derived from these tables are therefore based on the structure of the economy at that time, a structure that it is assumed remains fixed over time. When multipliers are applied, it is assumed that prices remain constant, technology is fixed in all industries and import shares are fixed.

Therefore, the changes predicted by IO multipliers proceed along a path consistent with the initial structure of the economy described by the IO output table. This precludes economies of scale. That is, no efficiency is gained by industries getting larger – rather they continue to consume resources (including labour and capital) at the rate described by the IO table. Thus, if output doubles, the use of all inputs doubles as well.

IO analysis also assumes unlimited supplies of all resources, including labour and capital; resource constraints are not a factor. It is thus assumed that no matter how large a development, all required resources are available, and there is no competition between industries for these resources.

Therefore, multiplier impacts should be interpreted with care, as they represent a linear response from the increase in final demand under implicit assumptions that an economy or industry has no spare capacity and that the productivity of that industry is constant.

These limitations of IO analysis are addressed by using CGE modelling. A CGE model captures the interlinkages between the markets of all commodities and factors, taking into account resource constraints, to find a simultaneous equilibrium in all markets. A global CGE model extends this interdependence of the markets across world regions and finds simultaneous equilibrium globally.

A dynamic model adds onto this the interconnection of equilibrium economies across time periods. For example, investments made today are going to determine the capital stocks of tomorrow and hence future equilibrium outcomes depend on today's equilibrium outcome, and so on.

Weaknesses of CGE modelling

One complaint sometimes levelled at CGE modelling is that the models are "black boxes". In part this complaint arises because of the computing used to drive the model and the thousands of simultaneous equations which are solved to reach a modelled equilibrium. However, it must be stressed that the equations which underpin the credible models used in Australia are based on rigorous economic theory.

This theory and the use of the models are generally well understood and respected by Australian Government decision makers. CGE models can be a powerful tool for understanding the implications of a project to a region and the state as it recognises not only the direct and second round impacts but the third and fourth round, etc. impacts of a project in a region.

A weakness of CGE models is that they can only model market impacts on economic variables such as regional gross product, consumption, production and population, etc. CGE models generally do not have the capacity to model wider social or environmental impacts although various modern models have attempted to capture some of these aspects (such as greenhouse gas emissions which are widely modelled using CGE models).

Further details on IO analysis is provided in Appendix C and details of our CGE model are provided as Appendix D.

Source: ACIL Allen

IO modelling is well suited to understanding the employment and business benefits to NSW supply chains associated with the policy.

However, while CGE models naturally assume constraints on factor supplies (and consequently naturally include the opportunity cost of moving labour and capital between competing uses), they can be run with such constraints turned off. In doing so, CGE models are, in essence, IO models, with the key difference being that they can simultaneously solve for other economic facts through time (that is, dynamic CGE models will automatically forecast changes in IO multipliers based on underlying assumptions about the growth in population, labour supply, labour productivity, etc.). They can also more easily accommodate the introduction of new industries (such as, say, a new battery manufacturing plant being built in NSW in 2025), with the consequent effects on local employment and economic activity.

Based on discussions with the Department, the Chairs of the Renewable Energy Sector Board and the Regulator, the economic impacts were modelled using both CGE and IO modelling. The CGE model estimates the net impact of the economy while the IO modelling provides partial information to explain the outcomes from the CGE model.

2.4.4 Economic impact modelling

Having developed the modelling inputs, we estimated the economy wide impacts of the different local content scenarios using an IO model and our CGE model *Tasman Global*.

We estimated the economic impact of the different local content scenarios on the New South Wales economy and the Australian economy as a whole, using the following indicators.

— **Real output** (Gross Domestic Product (GDP) and Gross State Product (GSP)) — real output represents the total dollar value of all finalised goods and services produced over a specific time period and is considered as a measure of the size of the economy.

— **Real income** (Gross Real Income, (GRI)) — real income measures the income available for final consumption and saving after adjusting for inflation. An increase in real income means that there has been a rise in the capacity for consumption as well as a rise in the ability to accumulate wealth in the form of financial and other assets. The change in real income from a project is a measure of the change in the economic welfare of residents within an economy. For this reason, real income is ACIL Allen's preferred measure of economic impact.

— **Gross Value Added (GVA) by industry**— GVA measures the value of goods or services produced by a given industry in a given region, less the intermediate goods and services used to produce it. As the name suggests it is a measure of the value an industry adds to an economy.

— **Real employment** — an indicator of jobs numbers in the economy. Labour market impacts are typically produced on an annual Full Time Equivalent (FTE) basis.

— **Real wages** — wages refer to money that is paid or received for work or services. Real wages refer to wages adjusted for the effect of prices (inflation).

— **Foreign trade** — refers to the real exports, real imports and net foreign trade.

— **Government revenue/taxation** — taxation results are completed by major heads of taxation. This typically includes payroll tax and GST at a State level, and company tax – both directly paid by the project and by others as a result of changes in economic activity – personal income tax, other Commonwealth taxes like excise.

The results of the economic impact assessment are provided over the agreed life of project period for each of the local content scenarios.

2.4.5 Other costs and benefits

Local procurement can have a range of benefits and costs (see Table 2.10). While many of these impacts have been quantified through economic modelling, there are a range of impacts that are difficult to quantify either for their non-monetary nature or due to time and resource constraints for this project. We analysed these impacts qualitatively (qualitative consideration of all the impacts is preferable to assuming those impacts do not exist or have no value). The impacts that are qualitatively discussed in chapter 5 are highlighted in blue in Table 2.10. This discussion includes information about the direction of the impact and its likely significance.

Table 2.10 Summary of selected costs and benefits

	Costs	Benefits

Societal level	– Additional capital expenditure associated with local content requirements (refer section 2.3)
	– Additional operating expenditure associated with local content requirements (refer section 2.3.4)
		– Economic impacts (refer section 2.4.4)
		  – Economic activity and income, including impact of investment and higher energy prices
		  – Labour market, including employment and wages
		– Labour market (refer Chapter 5)
		  – Skills development
		  – Retention
		  – Increased participation of First Nation people and unrepresented groups
		– Increased business opportunities (refer Chapter 5)
		  – Critical mass
		  – Gravity effect
		  – Transfer of knowledge and innovation
		– Social and cultural (refer Chapter 5)
		  – Community participation
		  – Stronger culture of entrepreneurship
		  – Social investment
		  – Social licence to operate

Household level	– Impact on retail electricity bills (refer next section)	

Impact on retail electricity bills

The impact of the local content requirements on retail electricity bills has been estimated for the following types of NSW electricity customers:

— residential customer with an afternoon peak load

— generic small business customer

— medium commercial and industrial (C&I) customer

— large C&I customer.

The energy consumption and peak demand for these customer profiles are set out in Table 2.11.

Table 2.11 Customer profiles

Type of customer	Energy consumption	Peak demand
	kWh per annum	kW
Residential	4,938	1.36
Small business	20,000	4.57
Medium C&I	690,163	188
Large C&I	1,560,774	488

Source: ACIL Allen based on previous modelling

The impacts have been calculated for each electricity distribution area (Ausgrid, Endeavour Energy and Essential Energy), assuming that the incremental costs associated with increased local content are allocated on the basis of peak demand (additional cost of network augmentation projects) and energy consumption (additional cost of generation).[33]

Further details on the assumptions and methodology for estimating the impact on retail electricity bills are provided in Appendix E.

2.5 Willingness to pay analysis

This section details the methodology for consumer research into the willingness of NSW electricity customers to pay a quantified increase to their energy bill to meet proposed minimum local content requirements for the infrastructure that is built to meet the modernise the NSW electricity system.

The most effective way to meet this aim is to conduct a choice modelling exercise among consumers (both residential and business). This approach allows the true 'willingness to pay' characteristics to emerge more effectively than if a simple direct approach to questioning is taken.

The consumer research included the following key phases:

1. design of the questionnaire
2. design of the sample
3. data collection
4. analysis of the data.

2.5.1 Questionnaire design

The choice modelling section of the questionnaire included a series of scenarios which differ based on a small number of attributes, each with a small number of levels. Participants were required to trade-off these attributes by comparing a baseline level of local content (new electricity infrastructure built at the lowest cost) to a higher level of local content. To manage the cognitive load on participants, each participant was asked between six and eight trade-off questions.

[33] NSW Government, Electricity Infrastructure Roadmap, *Electricity Infrastructure Fund (Part 7 of the Electricity Infrastructure Investment Act 2020), Policy paper,* September 2021, page 14

The attributes and levels that were tested are set out in Table 2.12. The wording of the attributes and levels was informed by four online focus groups that were conducted on Tuesday 26 and Wednesday 27 October 2021. The focus groups were for:

1. Sydney metropolitan, residential
2. Sydney metropolitan, business
3. NSW regional, residential
4. NSW regional, business.

The discussion guide for the focus groups is provided as Appendix F.

The focus groups revealed that the questionnaire should refer to:

— "transforming the NSW electricity system" rather than "modernising the NSW electricity system" as participants were unclear whether modernising the electricity system was a transformational change or incremental change

— the "lowest cost approach for consumers" rather than "least cost" as residential participants did not understand the concept of "least cost".

Prior to the focus groups, two different sets of cost increases were considered – either:

— 0, 3, 6 and 12 per cent, or

— 0, 2, 4 and 8 per cent.

The participants in the focus groups indicated a willingness to pay of up to 15 per cent for increased local content. However, without providing them with an explicit trade-off and potentially wanting to appear "socially desirable", this could have been inflated. It was agreed with the Department that the lower cost range should be included in the questionnaire, as the cost increase for local content was unlikely to be greater than 8 per cent.

Table 2.12 Trade-offs tested

Attribute	Levels
Local content - materials	The NSW electricity system is transformed using: – the lowest cost materials – somewhat more locally produced materials – as much locally produced materials as possible, which increases Australia's manufacturing capacity and future resilience
Local content - labour	The NSW electricity system is transformed with: – the current numbers of apprentices and trainees and workers in the local area – using more apprentices and trainees – using more workers from the local area
Local content – First Nations participation	The NSW electricity system is transformed with: – the current level of contribution from First Nations people – a higher contribution from First Nations people
Cost of electricity	The cost for electricity would: – stay the same – increase by 2% – increase by 4% – increase by 8% Notes: 1. The percentage bill increases were converted to a dollar figure based on each respondent's electricity bill

The full set of attributes and levels set out in Table 2.12 results in 48 different combinations that could have been tested. A fractional factorial approach was used so that a smaller number of combinations (16) was tested through the survey. The combinations were selected so that:

— each of the four cost levels was included in four scenarios

— the two materials levels (somewhat more and as much as possible) were included in two of each of the cost level scenarios

— of the "labour" levels, "same" was used in six scenarios, "more local workers" was used in five scenarios and "more apprentices and trainees" was used in five scenarios

— of the "First Nations" levels, "same" was used in seven scenarios and "more contribution" was used in nine scenarios.

The questionnaire also included standard socio demographic and geographic questions to ensure that the respondent sample was representative of the population and to support any segmentation of the responses. The survey was terminated if the respondent:

— could not provide a valid NSW postcode

— was not connected to the electricity grid

— was not aged 18 years or over

— was a business with more than 500 employees

— was not able to provide an estimate of their most recent electricity bill

— had a non-positive electricity bill.

The questionnaire included the following additional questions, with responses on a five point scale from very important to not important at all to assess the relative importance of a number of attributes associated with modernising the NSW electricity system:

1. How important to you is it that the NSW electricity system is transformed so that it is clean?
2. How important to you is it that the NSW electricity system is transformed at the lowest cost for consumers?
3. How important to you is it that the NSW electricity system is transformed using as much locally produced materials as possible?
4. How important to you is it that the NSW electricity system is transformed using as much labour from the local area as possible?
5. How important to you is it that apprentices and trainees contribute to transforming the NSW electricity system?
6. How important to you is it that First Nations people contribute to transforming the NSW electricity system?
7. How important to you is it that Australia builds local manufacturing capacity to improve our resilience?

The questionnaire approved by the Department is included as Appendix G.

2.5.2 Sample design

A statistically significant sample was assumed to be in the order of 200 respondents.[34] The size of the sample depends on the number of segments for which the willingness to pay (WTP) is required. The bigger the sample, the more the data can be segmented.

As a minimum, there could have been one segment of 200 across NSW, with the sample controlled for an appropriate representation across residential and small-medium sized businesses, and across metropolitan and regional areas. While small-medium sized enterprises are generally defined as up to 200 employees, for the purposes of the customer research, businesses were defined as up to 500 employees.

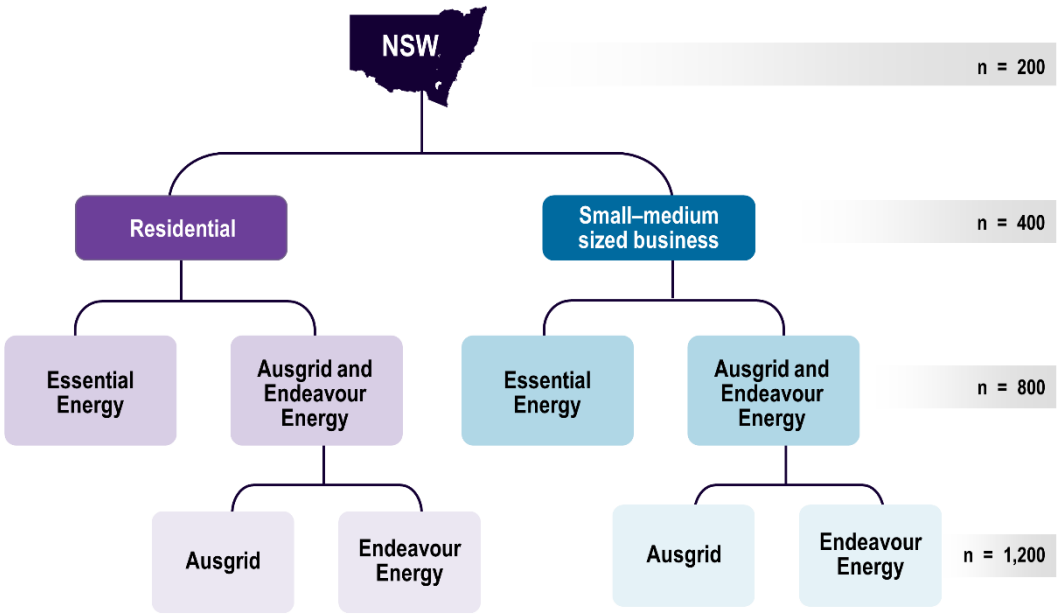
Alternatively, the sample could have been segmented by residential and small-medium sized businesses, in which case the sample size would need to be 400 – 200 for residential and 200 for small -medium-sized businesses, with the sample controlled for customers across metropolitan and regional areas.

The electricity bills for customers are higher in Essential Energy's distribution area than in Ausgrid's and Endeavour Energy's area. Accordingly, the hypothesis was that the WTP may be different for customers in Essential Energy's distribution area. The sample could have been segmented by distribution area, or by Essential Energy's distribution area and the other distribution areas.

These sample design options are illustrated in Figure 2.5. There are a myriad of other options that could have been considered using this type of logic.

[34] A smaller sample could be statistically significant if the responses by participants to all questions are reasonably similar.

Figure 2.5 Sample design options



Following discussions with the Department and the Chairs of the Renewable Energy Sector Board, the consumer research was undertaken with the objective to survey 1,200 participants – 200 residential participants and 200 business participants in each of the three NSW electricity distribution areas. The final sample is as set out in Table 2.13. While the number of residential participants was consistent with the sample design, the number of business participants in Ausgrid's and Essential Energy's was slightly higher than 200, and the number on Endeavour Energy's area was slightly lower than 200.

Table 2.13 Sample

Electricity distribution area	Residential participants	Business participants	Total
Ausgrid	200	201	401
Endeavour Energy	200	183	383
Essential Energy	200	203	403
Total	**600**	**587**	**1,187**

Source: ACIL Allen

2.5.3 Data collection

The data was collected by Wallis Social Research.

The methodology for the fieldwork is illustrated in Figure 2.6. This methodology is well-tested by Wallis for major population studies (such as those which are conducted for the Australian Electoral Commission).

At its core, surveys were administered via telephone, initiated by Wallis' Computer Assisted Telephone Interviewing (CATI) team. This was supported by the use of email and SMS reminders, and the option for online completion, where respondents chose this option. While a majority of interviews were conducted over the phone, the online option represented an important option to allow greater response rates than would otherwise be the case with a phone-only approach.

The questionnaire was loaded into CATI and tested before commencing data collection on Thursday 11 November 2021 for two weeks.

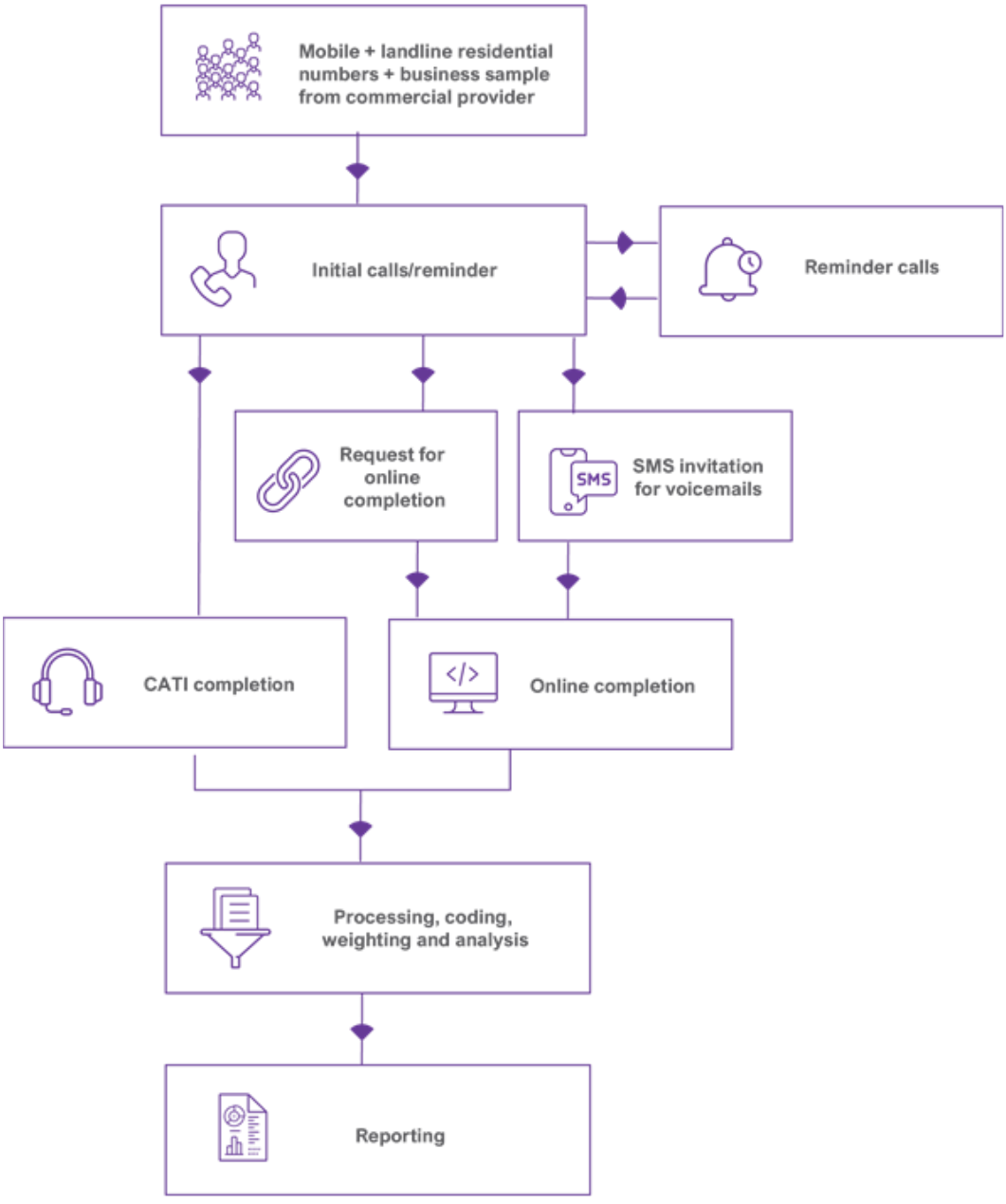
2.5.4 Data analysis

Wallis Social Research provided an output data file to ACIL Allen for analysis, and to calculate the willingness to pay using the choice modelling questions.

ACIL Allen reviewed the survey data to ensure the responses were robust. The data were then used to develop willingness to pay curves, which show the proportion of respondents willing to pay for increased local content, against a range of prices. ACIL Allen also examined whether any respondent characteristics correlated to increased or decreased propensity to pay, however the main focus was on the standard curves.

The curves were estimated using logit regressions to predict the proportion of the population which preferred the proposed scenario to the current scenario. ACIL Allen calculated the coefficients for each level of each attribute to be able to assess the key determinants of the willingness to pay.

Figure 2.6 Methodology for fieldwork



Economic impact of local content scenarios - inputs

3

As discussed in sections 2.3 and 2.4, a range of assumptions have been made to break down the costs associated with the projected new generation capacity and network augmentations into materials, labour and indirect costs[35], and into local and imported content, for the purposes of the economic modelling. This chapter aggregates the assumptions that have been made to provide an overview of the inputs to the economic modelling.

The inputs to the economic modelling for the construction or development phase are provided in section 3.1 and for the operating and maintenance phase are provided in section 3.2. The total local content assumed in the economic modelling is summarised in section 3.3. The estimated impacts of the local content scenarios on the retail electricity bills for NSW electricity customers are provided in section 3.4.

The costs that have been used in the economic modelling are based on the indicative projection of the new electricity infrastructure as provided to us by the Department. They would vary if a different projection of new electricity infrastructure had been used.

3.1 Construction or development phase

Based on the assumptions that have been used for the purposes of the modelling, the total undiscounted investment during the development phase is estimated to vary from $43.2 billion under the base case to $45.1 billion under the modest local content scenario and $47.8 billion under the ambitious local content scenario (in 2021 dollars), as set out in Table 3.1. During the development phase, the increased local content is estimated to result in an additional $1.6 billion of investment under the modest local content scenario and $4.1 billion of investment under the ambitious local content scenario (discounted to 2021).

Table 3.1 Investment, development phase (in 2021 dollars)

	Undiscounted investment	Discounted investment
Base case	$43.2 billion	$38.6 billion
Modest local content scenario	$45.1 billion	$40.2 billion
Ambitious local content scenario	$47.8 billion	$42.6 billion
Increase relative to base case		
Modest local content scenario	$1.9 billion	$1.6 billion
Ambitious local content scenario	$4.6 billion	$4.1 billion

[35] Indirect costs are the costs that are directly related to the production of a particular or service. Indirect costs include selling, general and administrative costs.

	Undiscounted investment	Discounted investment

Note: Investment discounted to 2021 using the discount rates in Table 2.9

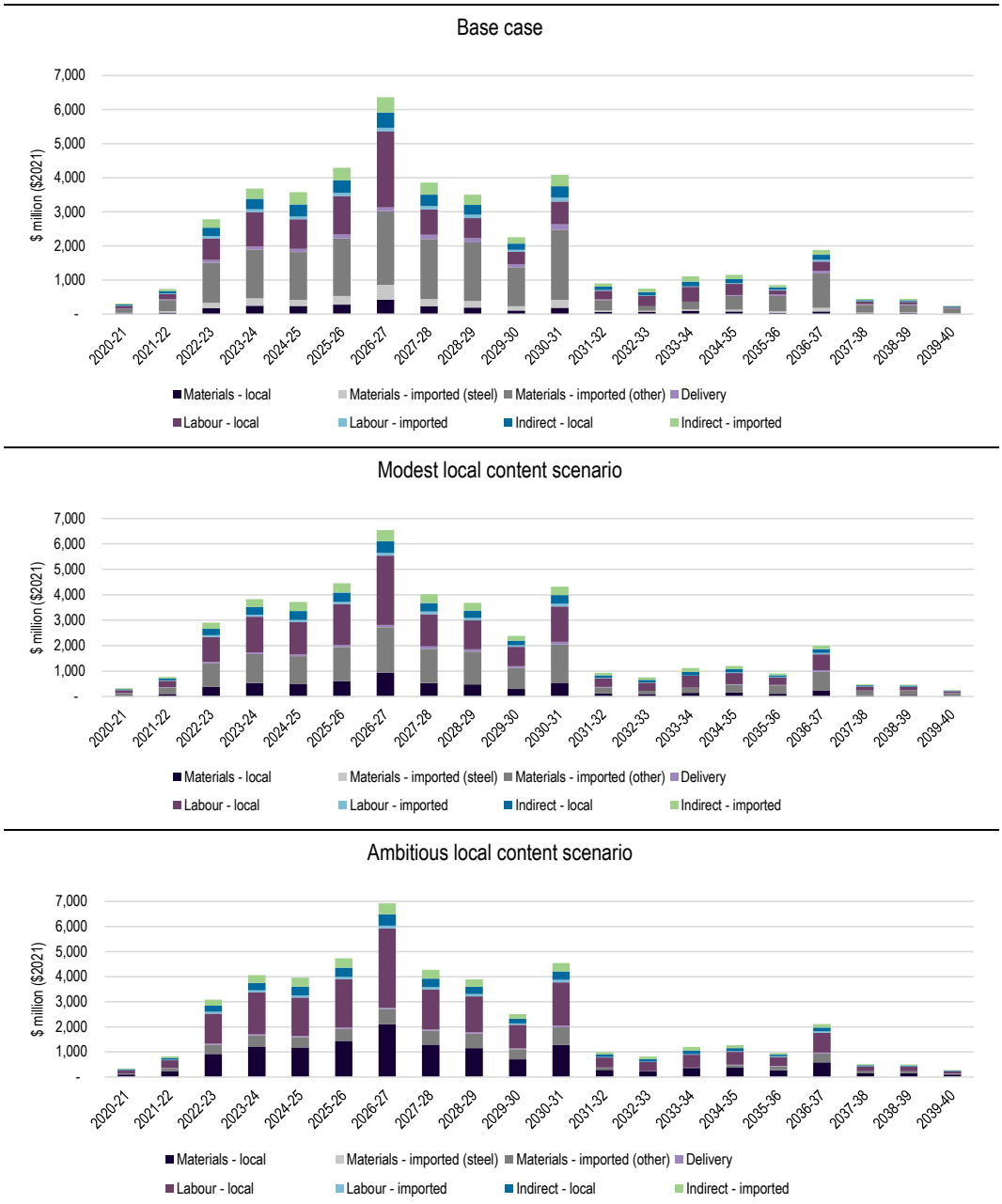
Source: ACIL Allen analysis

The projected timing and composition of the investment during the development phase, by local content scenario, is illustrated in Figure 3.1.

Based on the assumptions used in the modelling, the majority of the investment (82 per cent) is projected to occur by 2030-31, with a peak in 2026-27. On an undiscounted basis, the local content represents 39 per cent of the total investment[36] under the base case, 56 per cent under the modest local content scenario and 77 per cent under the ambitious local content scenario.

[36] The local content is the local materials, local labour and local indirect costs as a proportion of total costs.

Figure 3.1 Projected timing and composition of investment during development phase, by local content scenario



Source: ACIL Allen

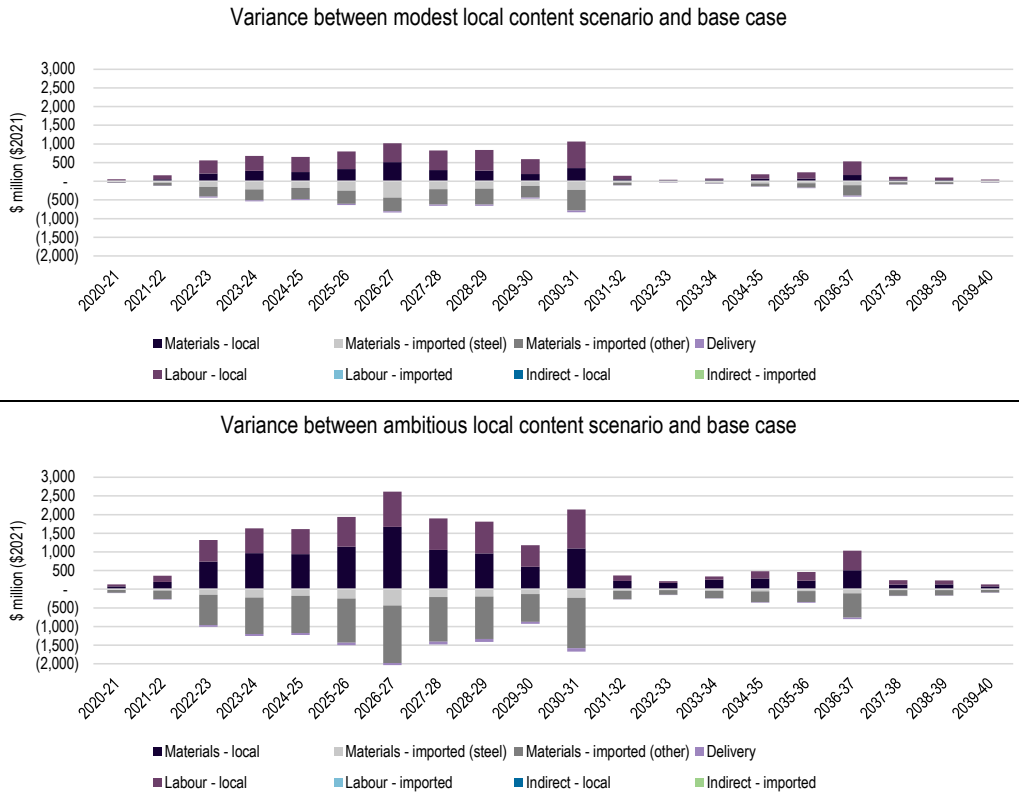
Figure 3.2 illustrates the projected change in the composition of the investment during the development phase between the base case and the:

— modest local content scenario in the upper pane

— ambitious local content scenario in the lower pane.

As would be expected, under both the modest and ambitious local content scenarios, the projected investment in local materials and labour increases and the investment in imported materials decreases. The magnitude of the increases and decreases are greater under the ambitious local content scenario than under the modest local content scenario.

Figure 3.2 Estimated change in the composition of investment during development phase



Source: ACIL Allen

The estimated local content during the development phase under each scenario, by technology, is summarised in Table 3.2. The estimated local content varies by technology – ranging from 20 per cent under the base case for battery storage and 26 per cent for wind to 93 per cent under the ambitious local content scenario for transmission. The estimated local content for wind and battery storage is low under the base case because of a high proportion of imported material – rotors, nacelles and wind towers in the case of wind, and batteries and cables in the case of battery storage. The estimated local content for transmission is high under the ambitious local content scenario because all imported components other than the large transformers (1,500 MVA) are assumed to be locally manufactured.

The estimated local content is higher under the modest local content scenario than the base case and higher under the ambitious local content scenario than under the modest local content scenario.

In the case of wind, for example, there is estimated to be a more substantial increase in local content from the base case to the modest local content scenario than from the modest local content scenario to the ambitious local content scenario. It is assumed that rotors and nacelles are assembled locally and towers are manufactured locally under the modest local content scenario. The most significant change between the modest local content scenario and the ambitious local content scenario is the local manufacture of rotors and nacelles rather than local assembly.

In the case of solar, for example, there is estimated to be a more substantial increase in local content from the modest local content scenario to the ambitious local scenario than from the base case to the modest local content scenario. The only change from the base case to the modest local content scenario is the use of local steel and a small increase in the cost of local labour. It is assumed that the solar PV modules are manufactured locally under the ambitious local content scenario.

Table 3.2 Estimated local content under each scenario, by technology, development phase

Technology	Base case – lower bound on local content	Modest local content scenario	Ambitious local content scenario
Generation, storage and firming technologies (including connection assets)			
Wind	26%	51%	72%
Large scale solar PV	44%	50%	81%
Pumped hydro (8 hours)	65%	68%	86%
Battery storage	20%	23%	78%
Network augmentation			
Transmission	66%	77%	93%

Note: Local materials, labour and indirect costs as a proportion of total costs

Source: ACIL Allen assumptions

A more detailed breakdown of the content for each technology is provided as Appendix H. As discussed in section 2.4.1, the steel requirements were assumed to be imported in the base case and local in the modest and ambitious local content scenarios.

3.2 Operating and maintenance phase

The total estimated undiscounted investment during the operating and maintenance phase varies from $19.0 billion under the base case to $19.3 billion under the modest local content scenario and $19.9 billion under the ambitious local content scenario (in 2021 dollars), as set out in Table 3.3. During the development phase, the increased local content results in an additional $0.2 billion of investment under the modest local content scenario and $0.6 billion of investment under the ambitious local content scenario (discounted to 2021).

Table 3.3 Investment, operating and maintenance phase (in 2021 dollars)

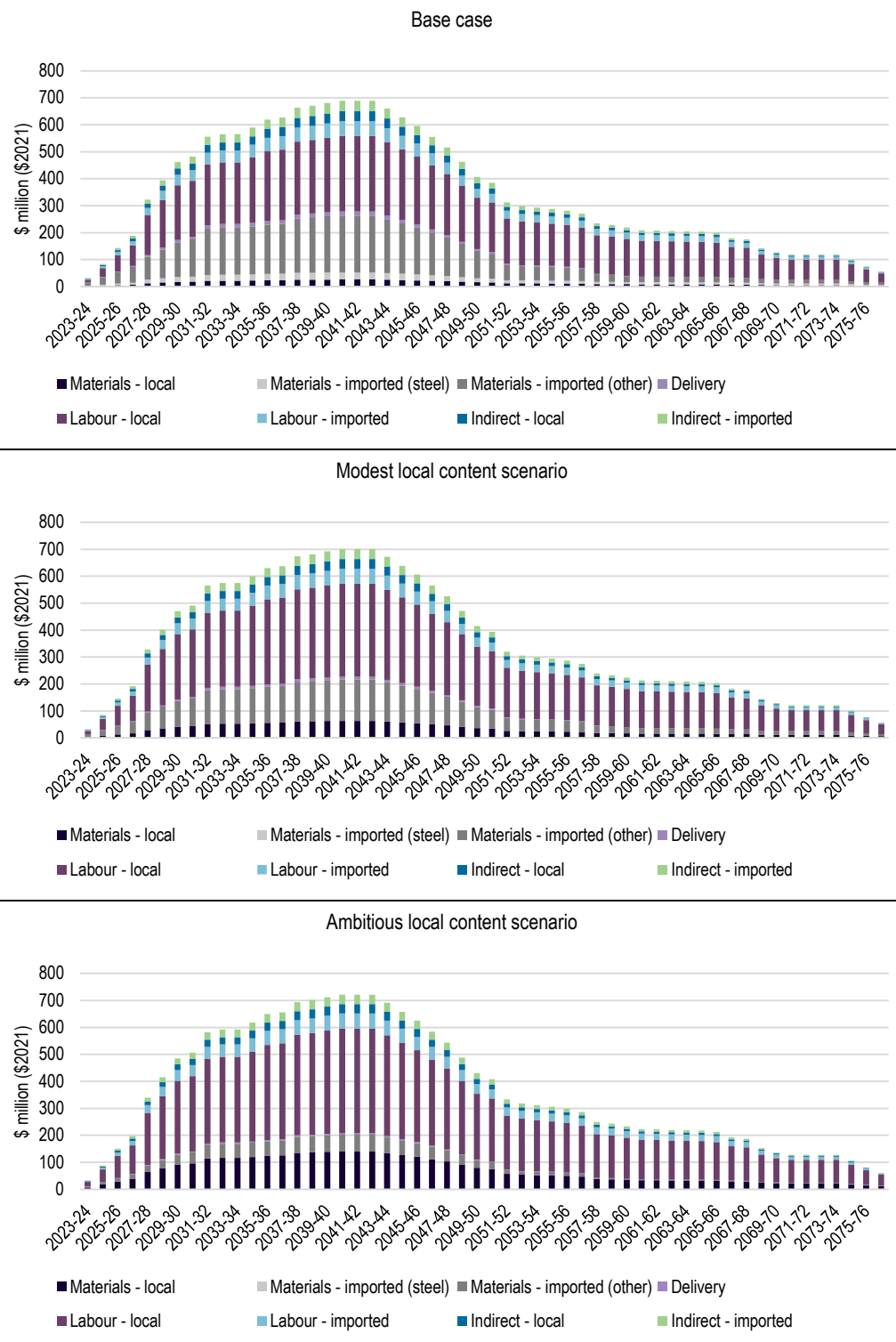
	Undiscounted investment	Discounted investment
Base case	$19.0 billion	$12.7 billion
Modest local content scenario	$19.3 billion	$12.9 billion
Ambitious local content scenario	$19.9 billion	$13.3 billion
Increase relative to base case		
Modest local content scenario	$0.3 billion	$0.2 billion
Ambitious local content scenario	$1.0 billion	$0.6 billion

Note: Investment discounted to 2021 using the discount rates in Table 2.9

Source: ACIL Allen analysis

The projected timing and composition of the investment during the operating and maintenance phase, by local content scenario, is illustrated in Figure 3.3.

Figure 3.3 Projected timing and composition of expenditure during operating and maintenance phase, by local content scenario



Source: ACIL Allen

The operating and maintenance expenditure is projected to increase each year to 2040-41 with additional new capacity, is maintained in real terms to 2042-43, and then to decline to 2076-77 as the new capacity reaches the end of its life. On an undiscounted basis local content is estimated to be 56 per cent of the operating and maintenance expenditure under the base case, 67 per cent

under the modest local content scenario and 80 per cent under the ambitious local content scenario.[37]

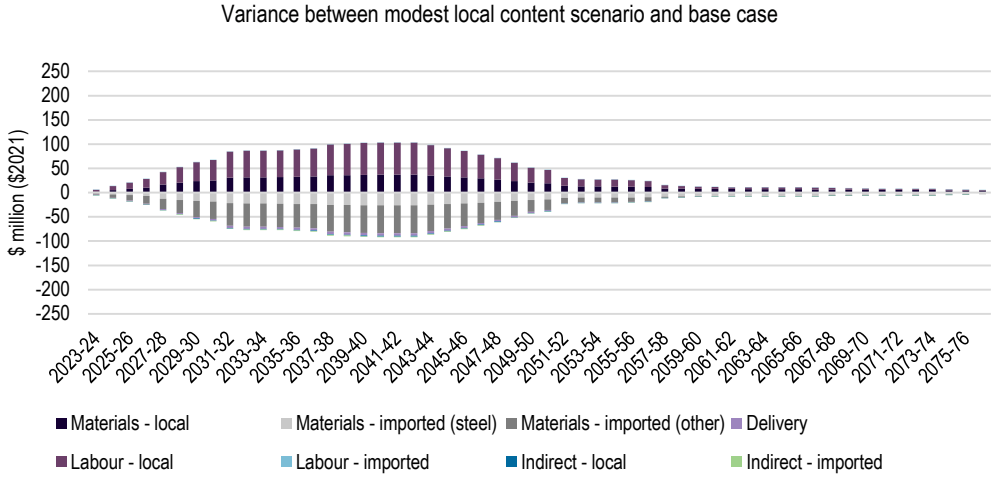
Figure 3.4 illustrates the estimated change in the composition of the expenditure during the operating and maintenance phase between the base case and the:

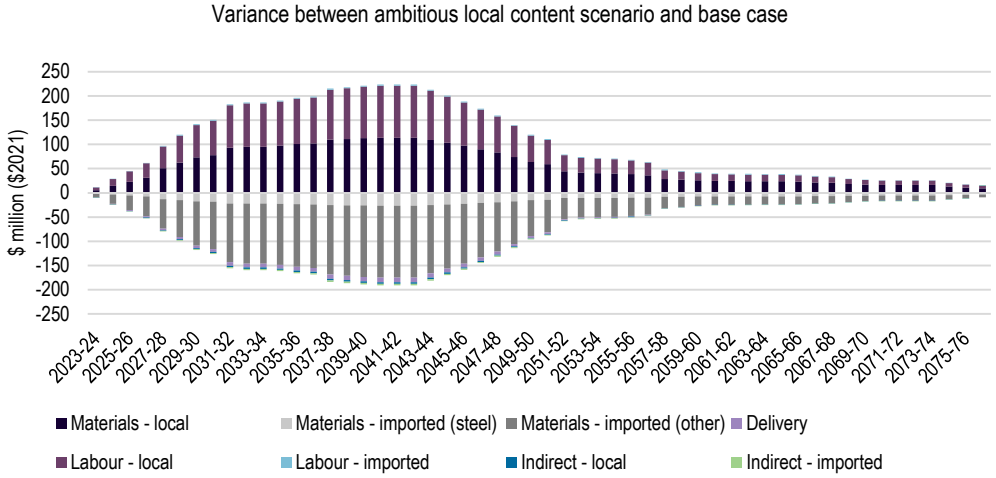
— modest local content scenario in the upper pane

— ambitious local content scenario in the lower pane.

As would be expected, under both the modest and ambitious local content scenarios, the expenditure on local materials and labour increases and the expenditure on imported materials decreases. The magnitude of the increases and decreases are greater under the ambitious local content scenario than under the modest local content scenario.

Figure 3.4 Estimated change in the composition of expenditure during operating and maintenance phase





Source: ACIL Allen

The estimated local content during the operating and maintenance phase under each scenario, by technology, is summarised in Table 3.4. The estimated local content varies by technology – ranging from 31 per cent under the base case for battery storage to 87 per cent under the ambitious local content scenario for transmission. The estimated local content for battery storage is low under the base case because of a high proportion of imported material (batteries and cables). The estimated

[37] The local content is the local materials, local labour and local indirect costs as a proportion of total costs.

local content for transmission is high under the ambitious local content scenario because all imported components other than the large transformers (1,500 MVA) are assumed to be locally manufactured.

The estimated local content is higher under the modest local content scenario than the base case and higher under the ambitious local content scenario than under the modest local content scenario.

The estimated local content is higher during the operating and maintenance phase than during the development phase because of the increased local labour, the proportion of which varies by technology – from 11 per cent for wind under the base case to 76 per cent for large scale solar PV under the ambitious local content scenario (refer Table 2.4).

Table 3.4 Estimated local content under each scenario, by technology, operating and maintenance phase

Technology	Base case – lower bound on local content	Modest local content scenario	Ambitious local content scenario
Generation, storage and firming technologies (including connection assets)			
Wind	42%	59%	75%
Large scale solar PV	69%	71%	81%
Pumped hydro (8 hours)	73%	75%	82%
Battery storage	32%	34%	79%
Network augmentation			
Transmission	71%	78%	89%

Note: Local materials, labour and indirect costs as a proportion of total costs

Source: ACIL Allen assumptions

A more detailed breakdown of the materials component of the operating and maintenance expenditure for each technology is provided as Appendix H.

3.3 Total local content

The local content has been estimated for each technology across both the development and operating and maintenance phases based on the discounted costs. The costs have been discounted using the technology-specific discount rates as set out in Table 2.9. The estimated total local content under each of these scenarios is set out in Table 3.5.

Table 3.5 Estimated local content under each scenario, by technology, development and operating and maintenance phases

Technology	Base case – lower bound on local content	Modest local content scenario	Ambitious local content scenario
Generation, storage and firming technologies (including connection assets)			
Wind	31%	53%	73%
Large scale solar PV	50%	55%	81%
Pumped hydro (8 hours)	66%	70%	85%
Battery storage	25%	29%	79%
Network augmentation			
Transmission	68%	77%	91%

Technology	Base case – lower bound on local content	Modest local content scenario	Ambitious local content scenario
Total for purposes of economic modelling			
Total	43%	59%	78%

Note: Local materials, labour and indirect costs as a proportion of total costs, based on discounted costs

Source: ACIL Allen assumptions

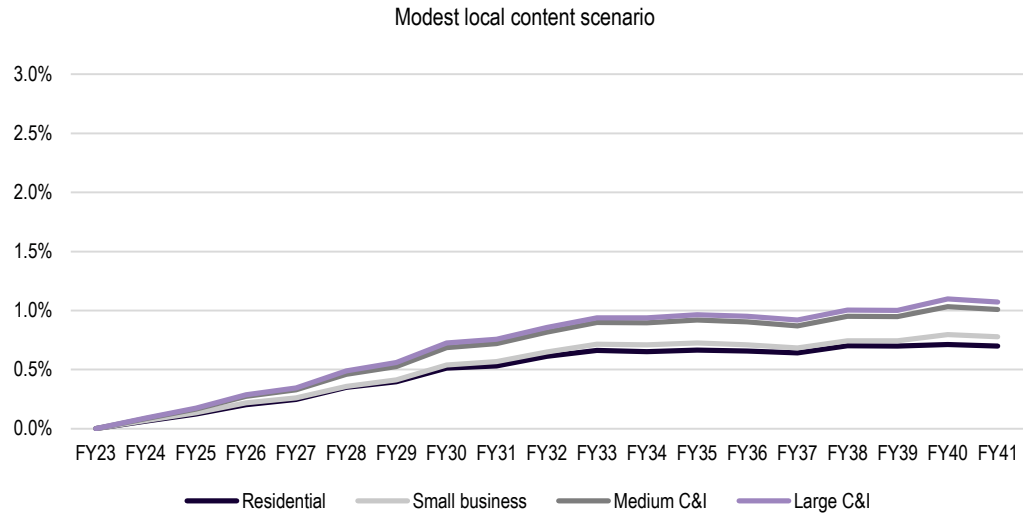
The estimated local content across the development and operating and maintenance phases is similar or slightly higher than for the development phase under all scenarios because the local content estimated for the operating and maintenance phase is higher than for the development phase. As discussed in section 3.2, the local content for the operating and maintenance phase is higher than for the development phase because a relatively high proportion of local labour is used during the operating and maintenance phase.

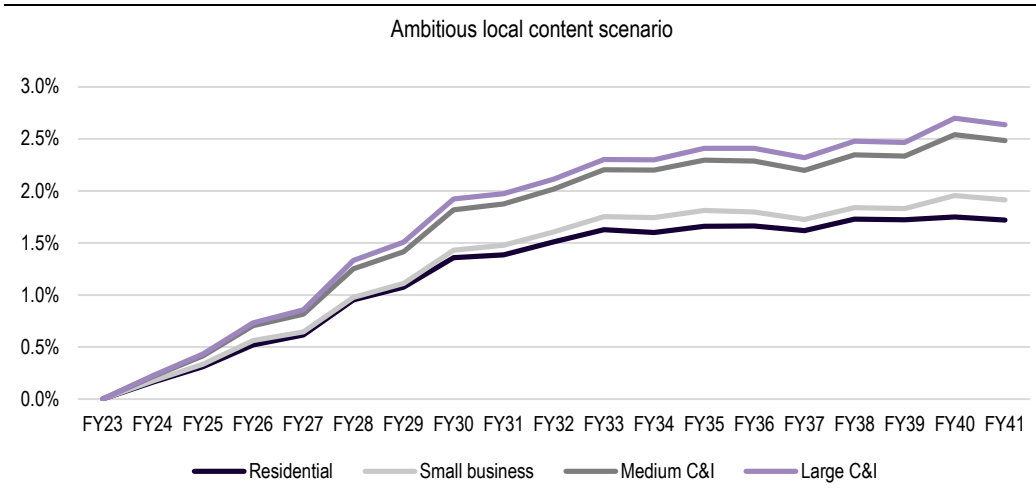
The total local content proportions would change if a different mix of generation technologies is assumed.

3.4 Impact of the local content scenarios on retail electricity bills

The estimated impacts of the local content scenarios, based on the assumptions that have been made, on the retail electricity bills for a residential, small business, medium commercial and industrial, and large commercial and industrial customer are illustrated in Figure 3.5. The estimated impact of the modest local content scenario is illustrated in the top pane and the estimated impact of the ambitious local content scenario is illustrated in the bottom pane.

Figure 3.5 Estimated impact of local content scenarios on retail electricity bills, NSW volume weighted average





Source: ACIL Allen

The estimated impact of the ambitious local content scenario on retail electricity bills is greater than the modest local content scenario, with retail electricity bills increasing by up to 1.1 per cent under the modest local content scenario and 2.6 per cent under the ambitious local content scenario.

The average estimated increases in retail electricity bills over the period from FY24 to FY 41 under each local content scenario are set out in Table 3.6.

Table 3.6 Average estimated increase in retail electricity bills, FY24 to FY41

Type of customer	Modest local content scenario	Ambitious local content scenario
Residential	0.5%	1.3%
Small business	0.5%	1.4%
Medium C&I	0.7%	1.7%
Large C&I	0.7%	1.8%
Weighted average	0.6%	1.6%

Source: ACIL Allen

The estimated impact of local content requirements on medium and large C&I customers is greater than for residential and small business customers. The increased costs associated with the local content requirements represent a larger proportion of the retail electricity bill for medium and large C&I customers than for residential and small business customers, because the unit cost of electricity for medium and large C&I customers is lower than for residential and small business customers.

To place these estimated retail electricity bill increases in perspective, the retail electricity bill for each customer type in 2021 is set out in Table 3.7. This table also includes the average annual increase in retail electricity bill for the modest and ambitious local content scenarios over the FY24 to FY41 period (in 2021 dollars).

Table 3.7 Retail electricity bill and average annual increases, by customer type, NSW volume weighted average, 2021 dollars

Customer type	Retail electricity bill - 2021	Average annual increase – modest local content scenario	Average annual increase – ambitious local content scenario
Residential	$1,381	$7	$11
Small business	$4,941	$27	$41
Medium C&I	$142,413	$996	$1,502
Large C&I	$313,911	$2,360	$3,561

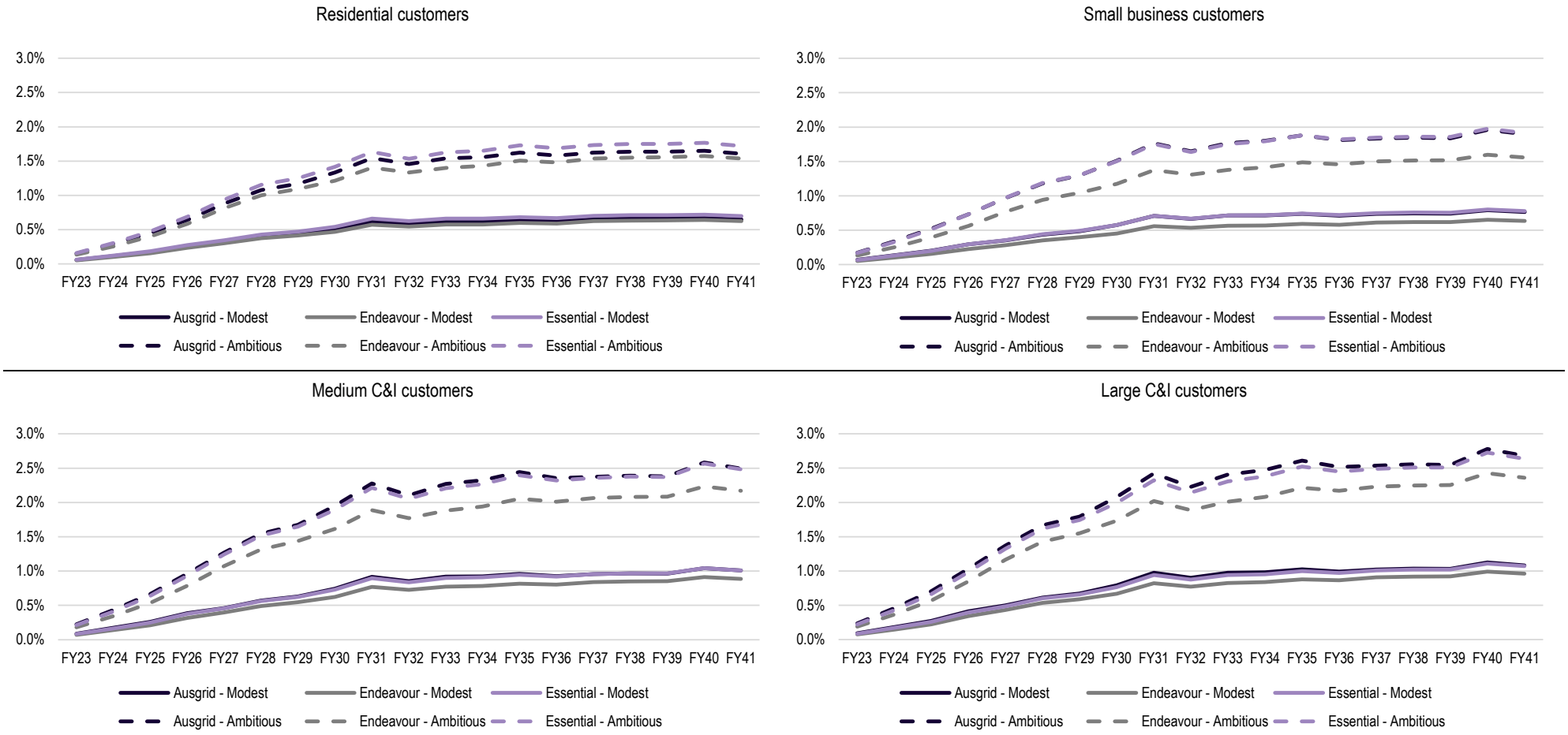
Source: ACIL Allen estimate

The estimated impacts of the local content scenarios on retail electricity bills, by electricity distribution area, are illustrated in Figure 3.6.

The estimated impacts of the local content scenarios are similar for residential customers in each of the electricity distribution areas under the modest local content scenario. Under the ambitious local content scenario, the estimated impacts are the greatest for residential customers in Essential Energy's area and lowest for residential customers in Endeavour Energy's area. This is because the additional costs are allocated to the electricity distribution areas based predominantly on energy consumption and also on peak demand. The energy consumption is the highest relative to peak demand in Essential Energy's area and is the lowest relative to peak demand in Endeavour Energy's area.

The estimated impacts on small business customers, medium C&I customers and large C&I customers are lower for customers in Endeavour Energy's area than for those in Ausgrid's and Essential Energy's areas under both the modest and ambitious local content scenarios. The estimated impacts are similar for customers in Ausgrid's and Essential Energy's areas. While there is a higher allocation of the additional costs to customers in Essential Energy's area than to customers in Ausgrid's area, the retail electricity bills for customers in Essential Energy's area are higher (due to higher network charges) and so the additional costs represent a relatively smaller proportion of the retail electricity bill.

Figure 3.6 Estimated impact of local content scenarios on retail electricity bills, by electricity distribution area



Source: ACIL Allen

Economic impact of local content scenarios – results

4

The following sections outline the projected broader economic impacts of the local content scenarios modelled.

— Section 4.1 outlines the projected gross economic contribution of the increased local content during the construction phase. This analysis excludes the operational phase where the costs of the local content requirements would be passed through to consumers in the form of increased energy prices and any crowding out implications. As such, it outlines the upper limit of the potential effects on the NSW and Australian economies associated with increased local content during the construction phase of the projects.

— Section 4.2 describes the projected net economic impact of the increased local content. This impact accounts for both the construction and operational phase of the projects (i.e. it accounts for both the increased investment in local content and the increased prices as a result of this increased local content) and crowding out implications.

All the results of the economic analysis are in 2020-21 dollars and all net present valuations of the impacts and contribution of the local content scenarios refer to Net Present Values (NPVs) in financial year 2020-21 of the impacts over the period 2020-21 to 2040-41 using a 7 per cent discount rate (unless otherwise noted).

4.1 Gross economic contribution

As noted in section 2.4.3, IO modelling was undertaken to explain the gross economic contribution (or 'footprint') of the increase in local content. This analysis only assesses the effects of the construction phase of the projects (the investment effect), and excludes the operational phase of the projects where the costs of the local content requirements are passed through to consumers (i.e. excludes the price effects). Hence, this analysis shows the gross (rather than a net) contribution of the local content scenarios.

By its nature, this analysis lacks supply constraints and so it implicitly assumes that businesses can source as much labour and capital as they require without impacting on prices. This means that output can be expanded without affecting other areas of the economy (i.e. it does not allow for crowding out effects). This analysis is useful to understand the potential employment and business benefits to NSW supply chains associated with the local content scenarios.

The analysis of the gross economic contribution of the local content scenarios describes:

— the *direct* contributions that the investment makes to the NSW economy and the Australian economy overall under the local content scenarios (compared to the base case), plus

— the full extent of the *indirect* contributions the local content scenarios make to each economy through the construction industry's demand for intermediate inputs from other industries (manufacturing, professional services, freight etc.) as well as through demand stimulated by the wages and salaries of employees (compared to the base case).

Additional details about how these contributions are measured are provided in Box 4.1. The estimates of the indirect contribution of the additional expenditure associated with the local content scenarios are provided as follows.

— *Production-induced contributions* — the production-induced estimates of the economic contribution of the local content scenarios (derived from simple multipliers) capture the contribution embodied in the construction industry's supply chain. That is, these estimates reflect the fact that, when the renewable projects are built and operated, they will purchase goods and services from suppliers in the construction industry's supply chain. These industries directly affected by construction also engage other industries, such as manufacturing, raw materials and transport, in producing its output, leading to second round production-induced contributions.

  These multipliers provide a conservative estimate (or lower level bound) of the indirect economic contribution of intermediate inputs. Adding up the direct economic contribution of the investment and the estimated production-induced contributions (compared to the base case), provides a lower bound estimate of the total contribution of the local content scenarios. When properly calculated[38], the lower bound estimates of the economic contribution of the construction industry under the local content scenarios are additive with the lower bound estimates for other non-overlapping sectors (such as health services, retail, etc.) and will never add to more than the NSW Gross State Product (GSP), Australia's total Gross Domestic Product (GDP) or total employment.

— *Consumption-induced contributions* — the consumption-induced estimates of the economic contribution of the local content scenarios (derived from total multipliers) capture the economic contribution made by the workers employed throughout the supply chain spending their after-tax incomes on other Australian goods or services (such as hairdressers, restaurants, retail traders, etc.). Adding up the direct economic contribution of the investment and the estimated production-induced and consumption-induced contributions provides an upper bound estimate of the total contribution of the local content scenarios. The upper bound estimate of the contribution of the local content scenarios captures all of the effects of inter-industry interactions and also captures the impacts of the purchasing decisions made by workers employed throughout the construction industry's supply chain. By their nature, upper bound estimates from different sectors are not additive and double count GSP/GDP (see Appendix B for additional details).

While the lower bound estimates of the footprint of the investment under different local content scenarios are useful for many contexts, they are a conservative estimate of the total economic activity or employment that could be associated with the local content scenarios. The upper bound estimates provide a better estimate of the total amount of economic activity or employment that will be affected by the investment in some manner.

The gross economic contribution of the expenditure related to the local content scenarios can be reported using a number of different measures.

— Value added — this measures the contribution of the investment to the size of the economy (i.e. its contribution to GSP or GDP) by measuring the impact of the projects on wages, salaries, profits and indirect taxes. Value added is the preferred measure of economic contribution.

[38] In particular, it is important to avoid double counting related to the intra-sectoral purchases and vertical supply chain activities. For example, when adding the impact of related industries (where industry A supplies to industry B, for example) it is necessary to not include the value of A's sales to B when calculating industry B's contribution. In reality, ensuring that industries are completely non-overlapping is complex and certain simplifying assumptions would generally need to be made.

— Output — this measures the total value of all transactions generated by the projects and its employees. This is not a preferred measure of economic contribution as it includes the value of intermediate inputs used by the investment that flow from value added generated by other entities.

— Employment — this measures the investment's contribution in terms of the number of direct and indirect jobs supported.

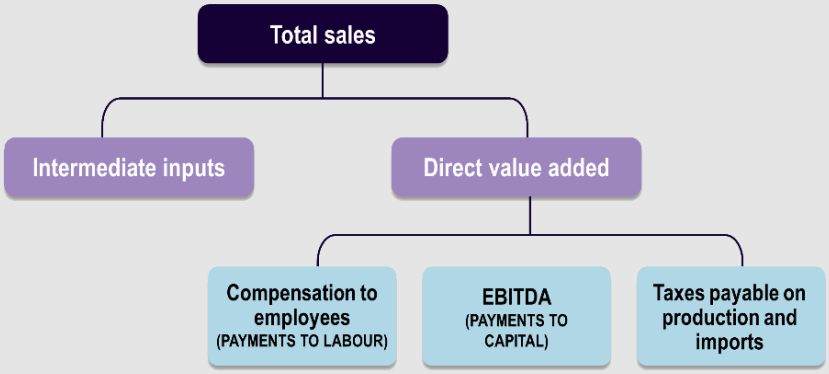
Box 4.1 Measuring economic contribution

The total economic contribution of the local content scenarios is measured through the direct economic contribution and the indirect contribution of the scenarios (compared to the base case). These are discussed in more detail below.

Direct economic contribution

The standard measure of economic contribution is the extent to which a project increases the value of goods and services generated by the economy as a whole – in other words, the extent to which it increases economic activity as measured by gross domestic product (GDP). An economy has a range of factors of production (including labour and capital stock) and access to various intermediate inputs. By using the factors of production appropriately, industries are able to add value to intermediate inputs by converting them into a range of goods and services more suited for use by consumers or other industries. A project's contribution to GDP measures the total value added generated and is defined as the income that a project generates, less the cost of the inputs that it uses to generate that income, plus certain taxes paid.

Therefore, the direct contribution of the renewable projects to the NSW and Australian economies under the local content scenarios can be estimated by determining their payments to the factors of production plus the taxes (less subsidies) payable on production and imports and comparing this to the direct contribution of the projects under the base case. This is shown graphically in the figure below.



Indirect economic contribution

Indirect effects are a broader notion of the economic contribution that includes supply-side. For example, when an employee of the project developer buys a restaurant meal, indirect effects are generated for the businesses supplying the produce, the transporter who made deliveries to the restaurant, the electricity company and other businesses that provided the inputs required to make the meal. To fully measure the indirect effects, account should also be taken of changes in incomes which may feed through to further changes in domestic demand.

The intermediate inputs used by a business can be sourced either from within the Australian economy or from foreign economies. If purchased from within the Australian economy, then the portion of value added embodied in the intermediate input is indirectly associated with the activity of the purchaser. The calculation of the indirect contribution quickly becomes difficult as one considers the value-added embodied in the intermediate inputs of the intermediate input. For example, in terms of the projected construction activities undertaken, consider a wind turbine tower used to generate electricity, the steel used to make the tower, the iron ore used in steel production, and so on.

In a global context, the value-added chain can simply be measured by the value of the final goods and services consumed. In a national context, input-output tables and the associated 'input-output multipliers' can be used to estimate the indirect economic contributions of a project. Input-output multipliers are summary measures generated from input-output (IO) tables that can be used for predicting the total impact of changes in demand for the output of any one industry on all industries in the economy. The tables and multipliers can also be used to measure the relative importance of the product chain linkages to different parts of the economy.

Source: ACIL Allen.

The estimated value added and employment contributions from the investment under different local content scenarios to the NSW and Australian economies are outlined in the sections below.

4.1.1 Value added contribution

Table 4.1 shows the estimated value added contributions from the modest and ambitious local content scenarios over the period 2020-21 to 2040-41 to the NSW and Australian economies in net present value terms using a 7 per cent discount rate (NPV7).

In terms of value added, it is estimated that the increased local content during the construction phase would contribute between $5.8 and $13.7 billion to the NSW economy under the modest and ambitious local content scenarios, respectively (in net present value terms). This contribution comprises:

— a direct contribution of between $51 and $843 million under the modest and ambitious local content scenarios, respectively[39]

— a production-induced contribution associated with the indirect value added embodied in the production chain of between $3.4 and $7.8 billion under the modest and ambitious local content scenarios, respectively

— a consumption-induced contribution associated with spending by workers employed throughout the supply chain of between $2.4 and $5.1 billion under the modest and ambitious local content scenarios, respectively.

The significantly higher value added contribution of the ambitious local content scenario compared to the modest local content scenario (despite the capex of the ambitious local content scenario being only around 6 per cent higher than the modest local content scenario) is mainly driven by the higher average local content.

It is also estimated that the increased local content would contribute between $9.1 and $19.7 billion to the overall Australian GDP (including the contribution to the NSW economy) under the modest and ambitious local content scenarios, respectively.

These estimates represent an upper limit on the potential effect on the NSW and Australian economy associated with increased local content during the construction phase of the projects. To place this in perspective:

— the estimated contribution to the NSW economy in net present value terms using a 7 per cent discount rate (NPV7) in 2020-21 is equivalent to between 0.9 and 2.1 per cent of NSW's GSP in 2020-21 under the modest and ambitious local content scenarios, respectively

— the overall contribution to the Australian economy (including the NSW economy) is equivalent to between 0.4 and 1 per cent of Australia's GDP in 2020-21 under the modest and ambitious local content scenarios, respectively.

[39] The direct economic contribution of the investment under the local content scenarios (compared to the base case) is a representation of the flow from labour and capital in the development and is measured as the sum of income earned by labour and capital in the project. This is calculated by adding wages paid to staff and the project's gross operating surplus (GOS). The GOS is a measure of profit or margin (treated as income earned by capital), while wages include employee related expenses and deferred superannuation expenses.

Table 4.1 Estimated value added contribution from increased local content during the construction phase (relative to the base case, FY2021 AUD$m), NPV7

	Direct contribution	Indirect contribution		Total contribution
		Production induced	Consumption induced	
Modest local content scenario				
NSW (GSP)	51	3,376	2,389	5,816
Rest of Australia	463	1,686	1,174	3,323
Australia (GDP)	514	5,062	3,563	9,139
Ambitious local content scenario				
NSW (GSP)	843	7,753	5,074	13,670
Rest of Australia	863	2,832	2,346	6,040
Australia (GDP)	1,706	10,585	7,419	19,710

Note: Estimates for Australia include NSW and rest of Australia. Totals may not add due to rounding.
Source: ACIL Allen estimates.

4.1.2 Employment contribution

Increased local content would also make an important contribution to NSW in terms of employment. While the local content scenarios will not result in *additional* direct employment in the projects compared to the base case (i.e. the projects are not assumed to employ more people, but to increase the share of *local* people employed in the developments), the local expenditure related to the projects will create a number of indirect jobs as a result of employees spending money in the community, and through spending by businesses that supply goods and services to the projects. In particular, as shown in Table 4.2, it is estimated that the total employment contribution to NSW associated with the increased local content over the period 2020-21 to 2040-41 would be between 51,586 and 117,268 full time equivalent (FTE) jobs under the modest and ambitious local content scenarios, respectively. This contribution comprises[40]:

— production-induced employment associated with the indirect employment embodied in the supply chain of between 27,450 and 67,082 workers under the modest and ambitious local content scenarios, respectively

— consumption-induced employment associated with the spending by workers employed throughout the supply chain of between 24,135 and 50,186 workers under the modest and ambitious local content scenarios, respectively.

On average, it is estimated that the construction of the renewable projects under the local content scenarios would generate between 2,345 and 5,330 FTE jobs per year.

In addition, the increased local content would support between 19,341 and 36,245 additional FTE jobs over the period 2020-21 to 2040-41 across the rest of the Australian economy under the modest and ambitious local content scenarios, respectively (an average of between 879 and 1,648 FTE jobs per year).

[40] Direct employment under the local content scenarios is the same as in the base case, but in the case of the local content scenarios a bigger share of this employment is sourced locally.

Table 4.2 Estimated employment contribution from increased local content scenarios during the construction phase (relative to the base case, FTE jobs), FY2021 to FY2041

	Direct contribution	Indirect contribution		Total contribution	Annual average
		Production induced	Consumption induced		
Modest local content scenario					
NSW	-	27,450	24,135	51,586	2,345
Rest of Australia	-	7,258	12,083	19,341	879
Australia	-	34,708	36,218	70,926	3,224
Ambitious local content scenario					
NSW	-	67,082	50,186	117,268	5,330
Rest of Australia	-	12,307	23,938	36,245	1,648
Australia	-	79,389	74,124	153,513	6,978

Note: FTE= Full time equivalent.

Source: ACIL Allen estimates.

4.2 Net economic impact

The previous section outlined the gross economic contribution (footprint) of the increased local content during the construction phase. This contribution excluded the operational phase of the projects where the costs of the local content requirements would be passed through to consumers in the form of increased energy prices and also assumed that there are no opportunity costs of the capital and labour associated with minimum local content requirements (i.e. the gross economic contribution assumed that both labour and capital are unconstrained, meaning that output can be expanded without affecting other areas of the economy). As such, it provided the upper limit on the potential effect on the NSW and Australian economy associated with increased local content during the construction phase of the projects.

In contrast, this section describes the net economic impact of the increased local content. This impact accounts for:

— both the construction and operational phase of the projects (i.e. it accounts for both the increased investment in local content and the increased prices as a result of this increased local content)

— constraints in the labour market (i.e. the opportunity cost of moving labour between competing uses).

While in this simulation labour has been constrained (but not fully constrained[41]), it has been assumed that there is unconstrained access to capital (that is, that the increased investment in the local content scenarios is not at the expense of other investments in NSW). Compared to the analysis in Section 4.1, this analysis provides a more realistic picture of the potential impacts of the local content scenarios as it accounts for both the benefits and costs of the scenarios.

[41] More specifically, the labour market is flexible in terms movement between occupations, industries and geographic regions (subject to changes in relative prices), and the total supply of labour (through increases in participation rates, average hours worked per employee, or through a reduction in unemployment rates) can adjust based on changes in real wages and relative demands compared to the base case. In contrast, a fully constrained labour market would assume that, while employees can move between occupations, industries or regions based on changes in real wages, the total hours worked or total employment would remain unchanged relative to the base case.

The following sections outline the projected broader economic impacts of the local content scenarios (compared to the base case). These broader economic impacts include the direct impacts outlined in Section 4.1 and also the indirect or flow-on impacts of the projects.

4.2.1 Real economic output

The projected changes in real economic output (GSP and GDP) associated with the local content scenarios over the period 2020-21 to 2040-41 are presented in Table 4.3, Figure 4.1 and Figure 4.2.

As mentioned above, broadly, the local content scenarios will have two effects:

— an investment effect during the construction phase (where local economic activity increases as a result of the projects)

— a price effect during the operational phase (where the costs of the local content scenarios will be passed through to consumers in the form of increased energy prices).

As shown in the top panels of Figure 4.1 and Figure 4.2, the investment effect from an increase in local content associated with the projected new investment is projected to lead to an increase in real output in the NSW economy and a decrease in real output in the rest of the Australian economy under both local content scenarios. The decrease in output across the rest of Australia is driven by the redirection of economic activity from these states and territories to NSW. These effects are offset by the effect of increases in energy prices (shown in the middle panels of Figure 4.1 and Figure 4.2) which lead to a decline in demand for goods and services in the NSW economy as residents have less income to spend in these other sectors. While the increase in energy prices lowers demand in NSW, it increases output across the rest of Australia as some economic activity relocates to other states with lower relative energy prices.

As shown in the bottom panels of Figure 4.1 and Figure 4.2 and Table 4.3, the net impact of these two effects is (relative to the base case):

— an increase in real economic output in NSW (i.e. real GSP) by a cumulative total of between $683 million and $1.7 billion under the modest and ambitious local content scenarios, respectively (with a net present value of between $544 million and $1.3 billion). This reflects the fact that, while the price effect decreases real output in NSW, this decrease is not enough to offset the local content investment effect, resulting in an overall gain in GSP over the analysis timeframe

— a small decrease in real economic output in Australia as a whole (i.e. real GDP) by a cumulative total of $34 million under the modest local content scenario. However, in net present value terms, it is projected that the modest local content scenario will result in an increase of $200 million in GDP. This 'discrepancy' is explained by the timing of the positive and negative impacts of the scenario, with the increases in GDP happening earlier in the period of analysis and the decreases happening later in the period, which results in a net increase in GDP in present value terms

— a cumulative increase in Australia's GDP of $263 million under the ambitious local content scenario (with a net present value of $675 million).

To place these projected changes in economic output in perspective:

— the discounted present value (using a 7 per cent discount rate) of the change in NSW output is equivalent to between 0.1 per cent and 0.2 per cent of NSW's current GSP under the modest and ambitious local content scenarios, respectively

— the discounted present value (using a 7 per cent real discount rate) of the change in national output is equivalent to between 0.01 and 0.03 per cent of Australia's current GDP.

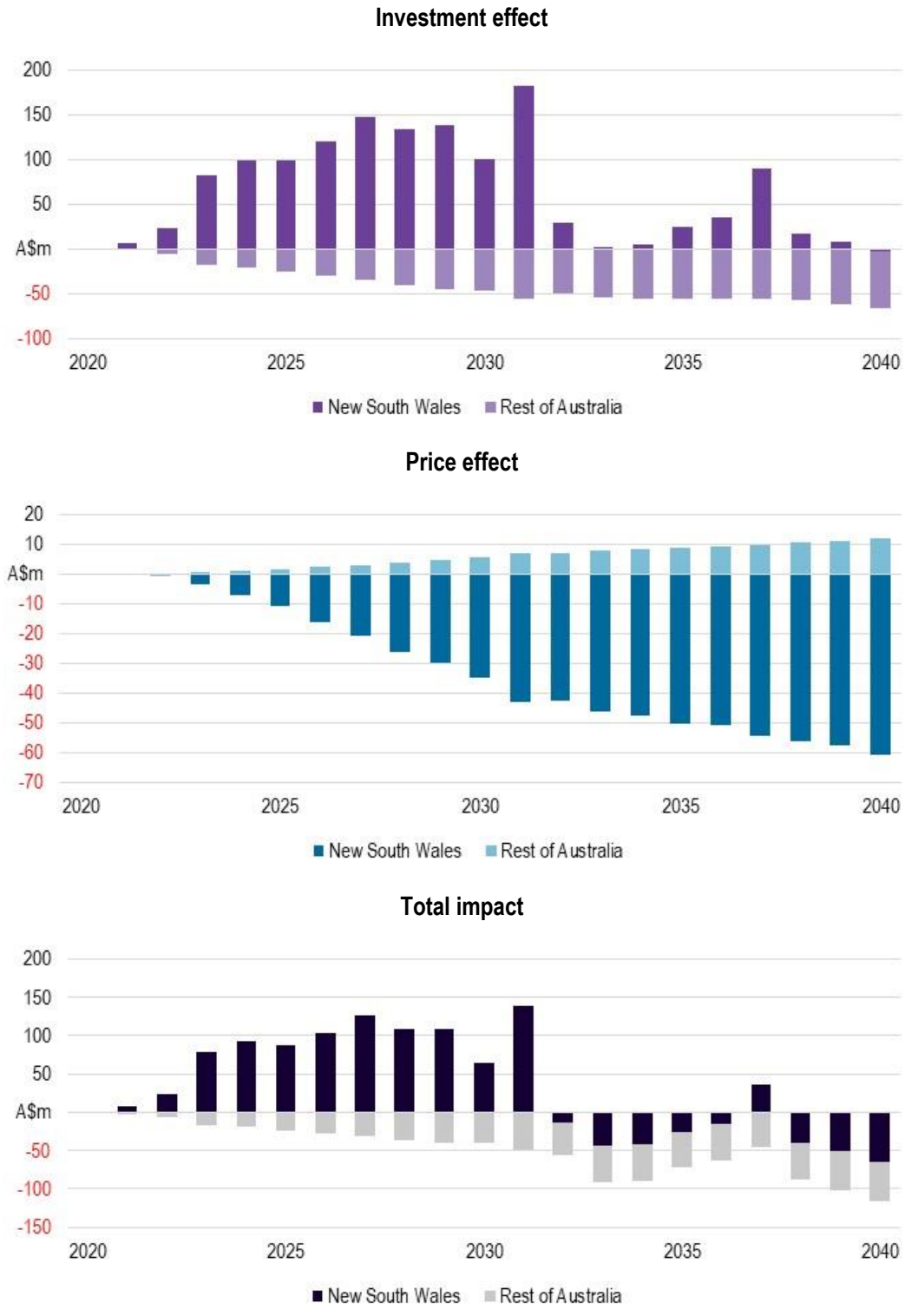
Table 4.3 Projected change in real economic output from increased local content (FY2021 to FY2041), relative to the base case (FY2021 AUD$m)

	Modest local content scenario				Ambitious local content scenario			
	Total	NPV3	NPV7	NPV10	Total	NPV3	NPV7	NPV10
New South Wales	683	626	544	486	1,652	1,518	1,324	1,185
Rest of Australia	-717	-513	-344	-263	-1,389	-983	-649	-491
Total Australia	-34	113	200	222	263	535	675	695

Source: ACIL Allen modelling.

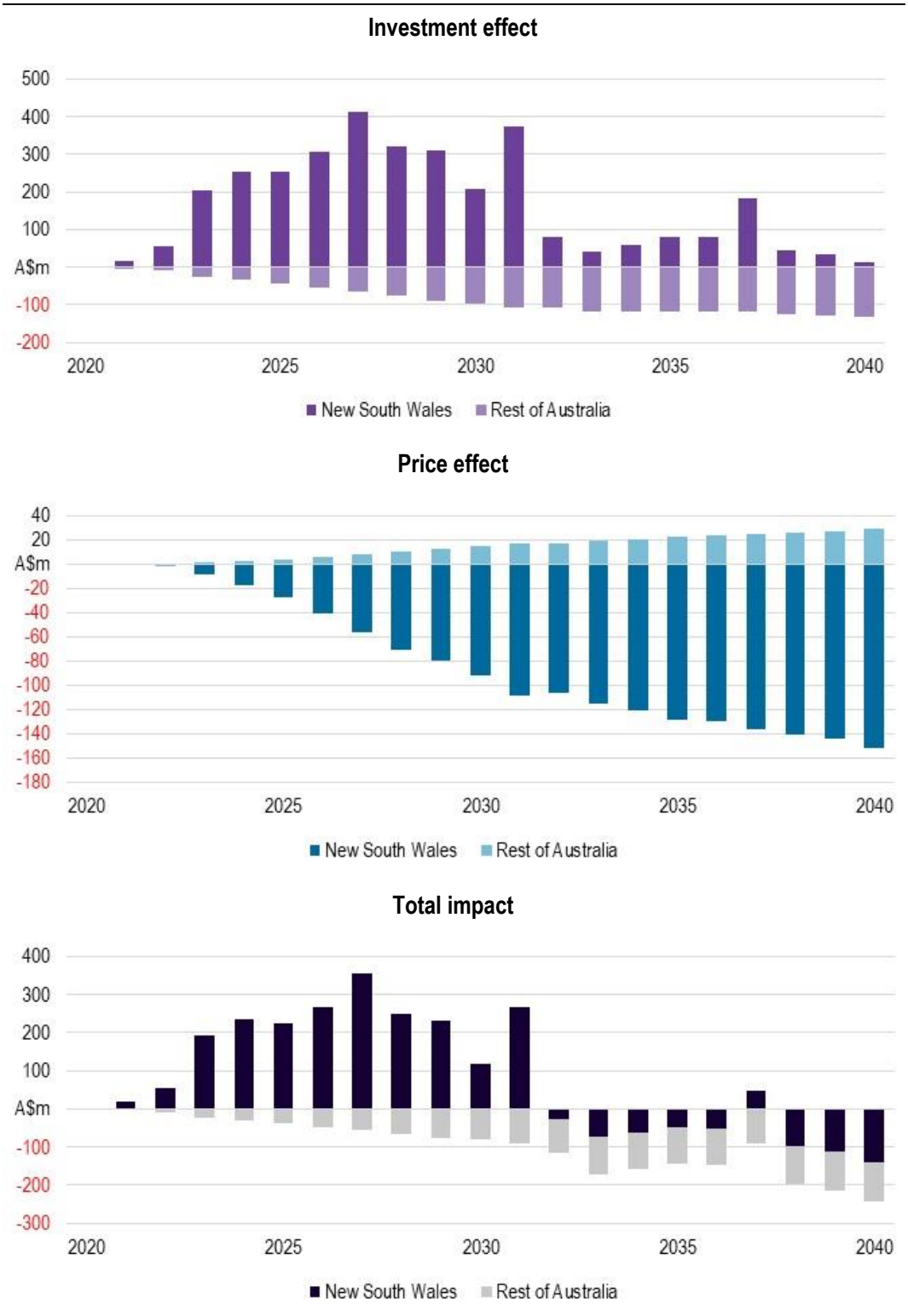
Notably, the economic analysis has been undertaken over the period 2020-21 to 2040-41 and the projected investments have an economic life which extends beyond this period. This will result in additional economic activity due to operational and maintenance expenditure. However, most of this activity would also have been local under the base case, resulting in a small amount of *additional* local activity under the local content scenarios. In contrast, the increases in energy prices to pay for the additional cost of local content during the construction phase of the projects will continue. This will result in the price effects lasting longer than the investment effects (the construction phase would take place over a relatively short period and the economic impacts of the construction activity itself are not expected to have lasting long term impacts on the economy). Without extending the modelling time frame, it is unknown whether this would result in an overall decrease in GSP/GDP in net present value terms. Extending the modelling would require information about energy prices and other inputs beyond what is included in the dataset provided by the Department.

Figure 4.1 Projected change in economic output (GSP/GDP) under the modest local content scenario, relative to the base case (real FY2021 terms)



Source: ACIL Allen modelling.

Figure 4.2 Projected change in economic output (GSP/GDP) under the ambitious local content scenario, relative to the base case (real FY2021 terms)



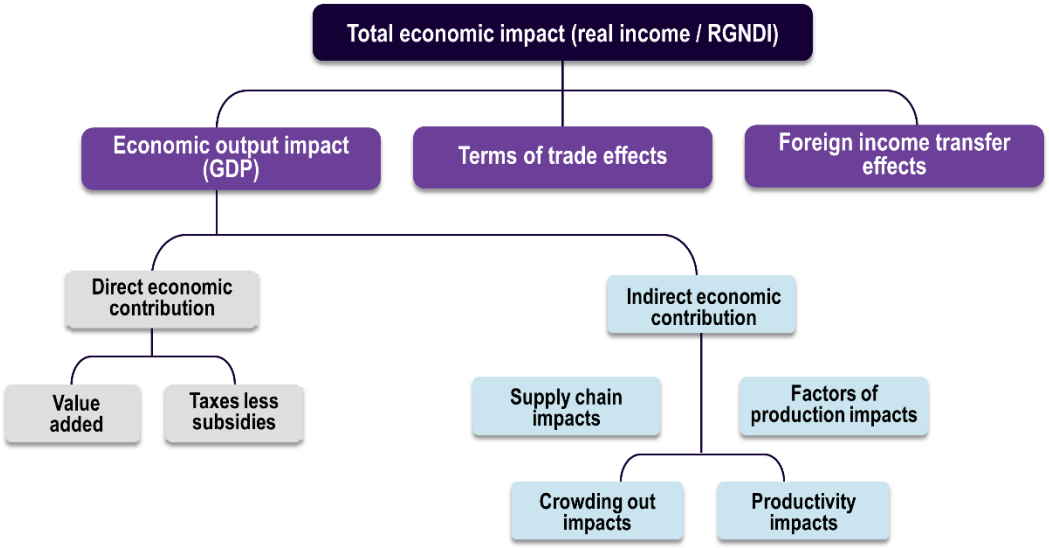
Source: ACIL Allen modelling.

4.2.2 Real income

Measuring the impact of a policy or project using just real economic output (GDP/GSP) may disguise investments or policy changes that are not beneficial in the overall economic welfare sense. This is because it is possible for real economic output to increase (that is, for GDP to rise) while at the same time consumers may be worse off as measured in terms of real income[42]. In such circumstances people and households would be worse off despite economic growth.

This leads to a preference for considering real income effects. Real income is a measure of the ability to purchase goods and services, adjusted for inflation. A rise in real income indicates a rise in the capacity for current consumption, but also an increased ability to accumulate wealth in the form of financial and other assets. The change in real income from a development is a measure of the change in welfare of the people in an economy. As shown in Figure 4.3, the change in real income at a national or regional level is a measure of real economic output plus external income transfers and the nation's or region's terms of trade (which measures the purchasing power of the nation's or region's exports relative to its imports).

Figure 4.3 Macroeconomic impact of a project or policy



Source: ACIL Allen

The change in a region's real income as a result of a policy change or investment (often referred to by economists as a policy 'shock') is therefore the change in the region's real economic output plus the change in net external income transfers plus the change in the region's terms of trade. As Australians have experienced first-hand in recent years, changes in the terms of trade can have a substantial impact on residents' welfare independently of changes in real economic output.

The projected changes in real income with the local content scenarios are presented in Table 4.4, Figure 4.4 and Figure 4.5. Similar to the output figures:

[42] The extent to which NSW or Australian residents benefit from any additional output produced by projects such as those being examined in this report depends on the level of domestic ownership of the capital utilised in the project (including the natural resources) as well as any wealth transfers undertaken by Australian governments as a result of the taxation revenues generated by the development. If most of the development is assumed to be owned by foreigners, a significant portion of the wealth generated by the economic activity is transferred outside of Australia (primarily to overseas shareholders), which could result in decreases in real income of NSW/Australian residents.

— the top panels of the figures show the investment effect from an increase in local content associated with the projected new investment (i.e. the benefits of the scenarios, relative to the base case)

— the middle panels show the effect of increases in energy prices to pay for the additional local content (i.e. the costs of the scenarios, relative to the base case)

— the bottom panels show the net impact of these two effects in the real income (relative to the base case).

The extent to which the NSW residents will benefit from the additional economic activity produced by increasing the local content associated with the projected new investment depends on the level of domestic ownership of the capital utilised in the projects, wealth transfers undertaken by the NSW Government as a result of the taxation revenues generated by the project and trade effects.

Given that a significant proportion of the potential employees for the development will be sourced locally, this will provide a significant boost to local incomes. However, as a proportion of the projects are assumed to be owned by overseas shareholders, a portion of the wealth generated by the economic activity is transferred outside of Australia.

The NSW Government will receive additional taxes derived from the developments and these taxes will be spent within the NSW economy. The additional demand for capital and labour stemming from the projects would also result in an improvement of the terms of trade relative to the base case. Overall, in net terms it is projected that the change in income resulting from increasing local content associated with the projected new investment will be significantly higher than the change in economic output.

More specifically, as shown in Table 4.4, over the period 2020-21 to 2040-41, the increase in local content is projected to (relative to the base case):

— increase the real income of NSW by a cumulative total of between $2.6 and $5.0 billion under the modest and ambitious local content scenarios, respectively. The present value of this change is equivalent to a one-off increase in real income of between $2.1 and $4.2 billion under the modest and ambitious local content scenarios, respectively

— reduce the real income of other states and territories (rest of Australia) as a result of the pull of activity towards NSW. While the rest of Australia will benefit somewhat from the price effect through terms of trade gains, these are not enough to offset the reductions in demand due to the local content effect

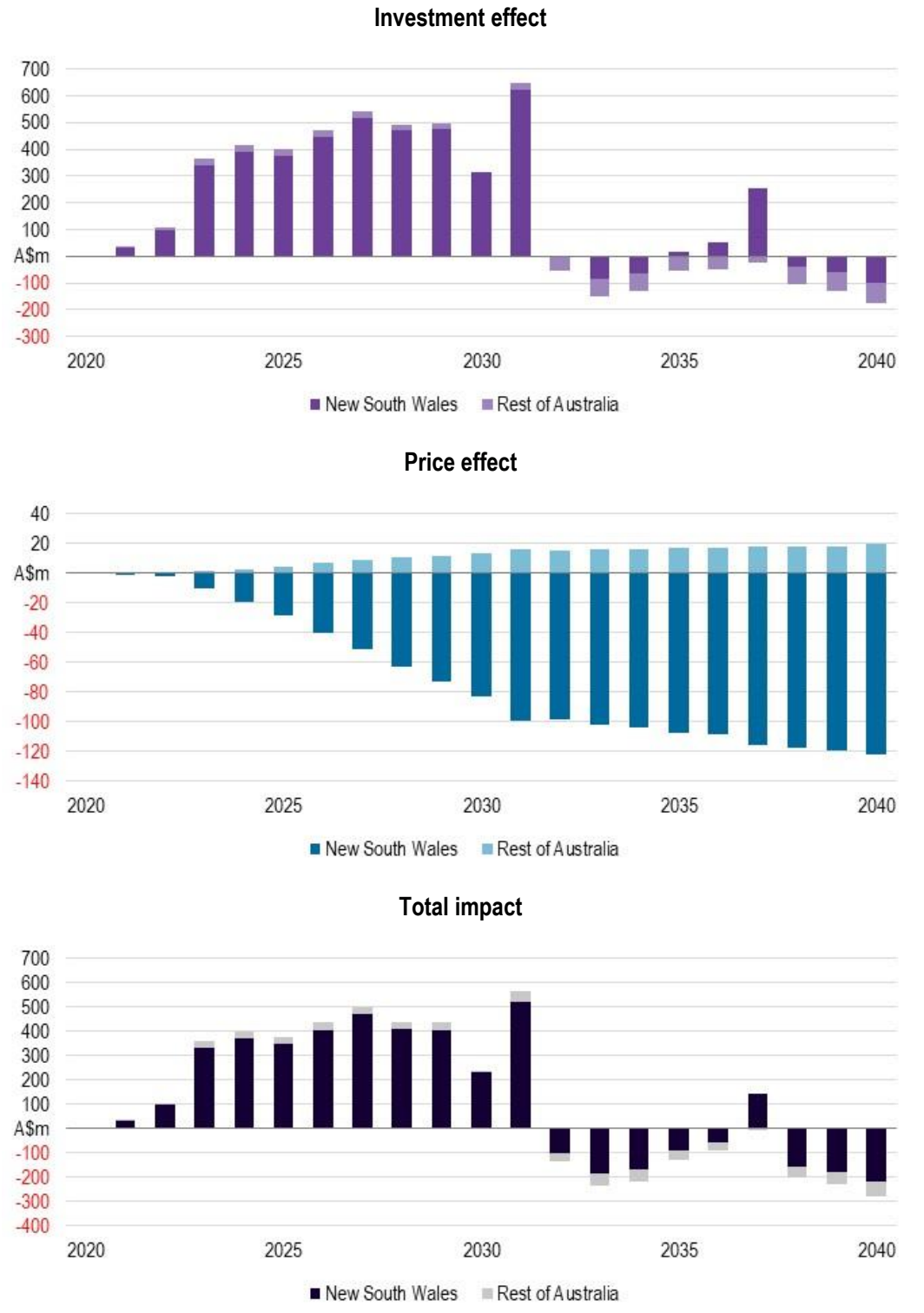
— increase the real income of Australia as a whole by a cumulative total of between $2.5 and $4.1 billion, under the modest and ambitious local content scenarios, respectively (with a net present value of between $2.1 and $3.8 billion).

Table 4.4 Projected change in real income under different local content scenarios (FY2021 to FY2041), relative to the base case (FY2021 AUD$m)

	Modest local content scenario				Ambitious local content scenario			
	Total	NPV3	NPV7	NPV10	Total	NPV3	NPV7	NPV10
New South Wales	2,608	2,399	2,094	1,877	4,970	4,721	4,233	3,848
Rest of Australia	-97	-7	53	72	-885	-614	-396	-294
Total Australia	2,510	2,392	2,146	1,950	4,085	4,107	3,838	3,553

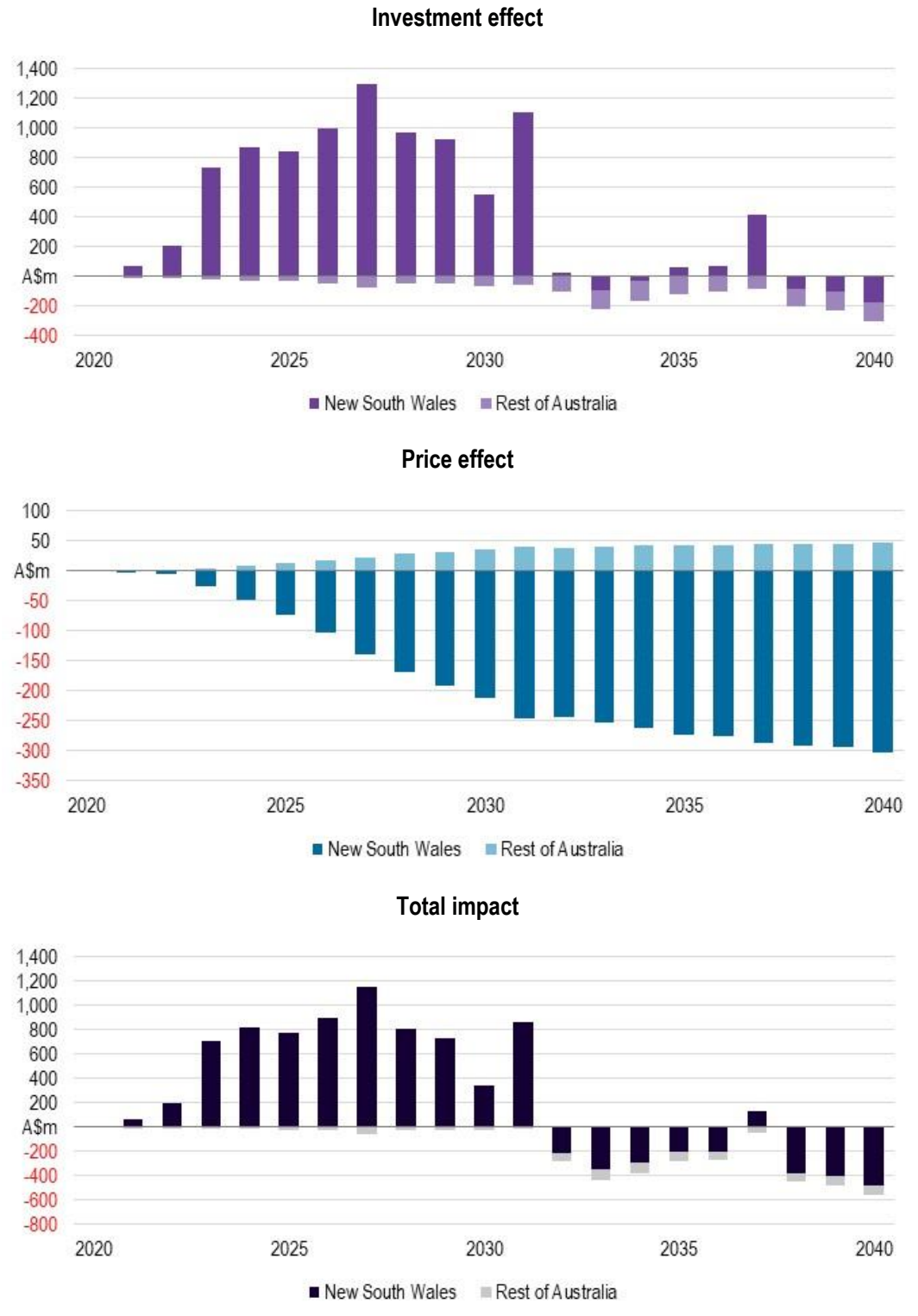
Source: ACIL Allen modelling.

Figure 4.4 Projected change in real income under the modest local content scenario, relative to the base case (real FY2021 terms)



Source: ACIL Allen modelling.

Figure 4.5 Projected change in real income under the ambitious local content scenario, relative to the base case (real FY2021 terms)



Source: ACIL Allen modelling.

To place these projected changes in income in perspective, the value in 2020-21 of this whole of life impact[43] is equivalent to increasing the average income of all current residents of:

— NSW by between $256 and $518 per person under the modest and ambitious local content scenarios, respectively

— Australia as a whole by between $84 and $149 per person under the modest and ambitious local content scenarios, respectively.

4.2.3 Employment and wages

In addition to the direct jobs generated on-site, the construction and operation of the facilities will require other NSW and Australian sourced goods and services. Supply of these inputs will increase the demand for labour across the NSW and Australian economy (that is, the developments will also create indirect jobs across Australia).

A key issue when estimating the impact of a project is determining how the labour market will clear.[44] For the net impact analysis, increases in the demand for labour can be met by three mechanisms: increasing migration; increasing participation rates and/or average hours worked; and by reducing the unemployment rate. In the model framework, the first two mechanisms are driven by changes in the real wages paid to workers in the local region while the third is a function of the additional labour demand relative to the base case. Given the moderate unemployment rate assumed throughout the projection period, changes in the real wage rate accounts for the majority of the additional labour supply in the local content scenarios relative to the base case.

It should be noted that this analysis does not assume any change in net foreign migration as a result of the renewable energy project and any foreign workers have not been included in the employment projections presented in this section.

Employment creation

The economic modelling projects that the increase in local content associated with the projected new investment will result in a net increase in jobs across Australia. Indeed, over the period 2020-21 to 2040-41 it is projected that between 19,185 and 32,984 employee years[45] of FTE direct and indirect jobs will be created in Australia under the modest and ambitious local content scenarios, respectively (see Table 4.5. More specifically, over the period 2020-21 to 2040-41 the local content scenarios are projected to increase total employment (by place of residence) in:

— NSW as a whole by between 13,236 and 23,182 employee years under the modest and ambitious local content scenarios, respectively (implying an average annual increase of between 662 and 1,159 FTE jobs)

— Australia as a whole by between 19,185 and 32,984 employee years under the modest and ambitious local content scenarios, respectively (an average annual increase of between 959 and 1,649 FTE jobs).

These impacts may be smaller than expected because, given Australia's strong labour market (characterised by low levels of unemployment and high rates of labour market participation), there is only a small pool of people who are currently not in employment that could be employed directly and indirectly on the projects. The projects and the flow on industries will therefore need to attract

[43] That is, the discounted present values of the projected changes in real income using a 7 per cent real discount rate.

[44] As with other CGE models, the standard assumption within *Tasman Global* is that all markets clear (i.e., demand equals supply) at the start and end of each time period, including the labour market. CGE models place explicit limits on the availability of factors and the nature of the constraints can greatly change the magnitude and nature of the results. In contrast, most other tools used to assess economic impacts, including I-O multiplier analysis, do not place constraints on the availability of factors. Consequently, non-CGE methods tend to overestimate the impacts of a project or policy.

[45] An employee year is employment of one full time equivalent (FTE) person for one year or one 0.5 FTE person for two years.

workers from other industries with the net result being that the cumulative job impact is not as high as might be expected.

Figure 4.6 illustrates the profiles of total additional employment under both local content scenarios. These profiles include both the local content and price effects. As shown in this figure, employment associated with the increased local content is projected to peak:

— in 2031 at around 1,870 FTE jobs in NSW and 780 FTE jobs in the rest of Australia under the modest local content scenario

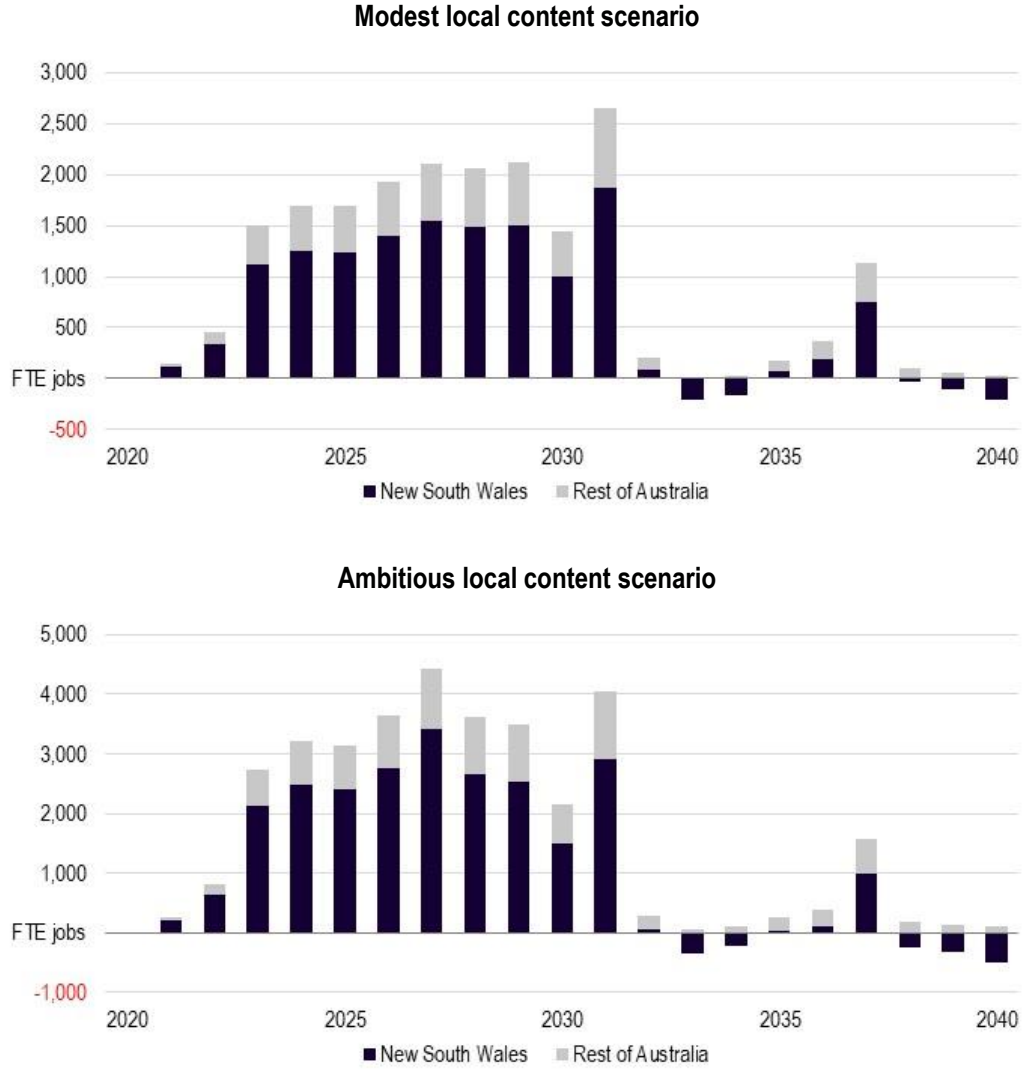
— in 2027 at around 3,410 FTE jobs in NSW and 1,018 FTE jobs in the rest of Australia under the ambitious local content scenario.

Table 4.5 Projected impacts of the increase in local content associated with the projected new investment on the labour market, relative to the base case

	Employee Years from FY2021 to FY2041	Average Employee Years from FY2021 to FY2041
Modest local content scenario		
NSW	13,236	662
Rest of Australia	5,949	297
Australia	19,185	959
Ambitious local content scenario		
NSW	23,182	1,159
Rest of Australia	9,802	490
Australia	32,984	1,649

Source: ACIL Allen modelling.

Figure 4.6 Projected change in total (direct and indirect) employment under the local content scenarios, relative to the base case (FTE jobs)



Note: FTE= Full time equivalent.

Source: ACIL Allen modelling.

Wages

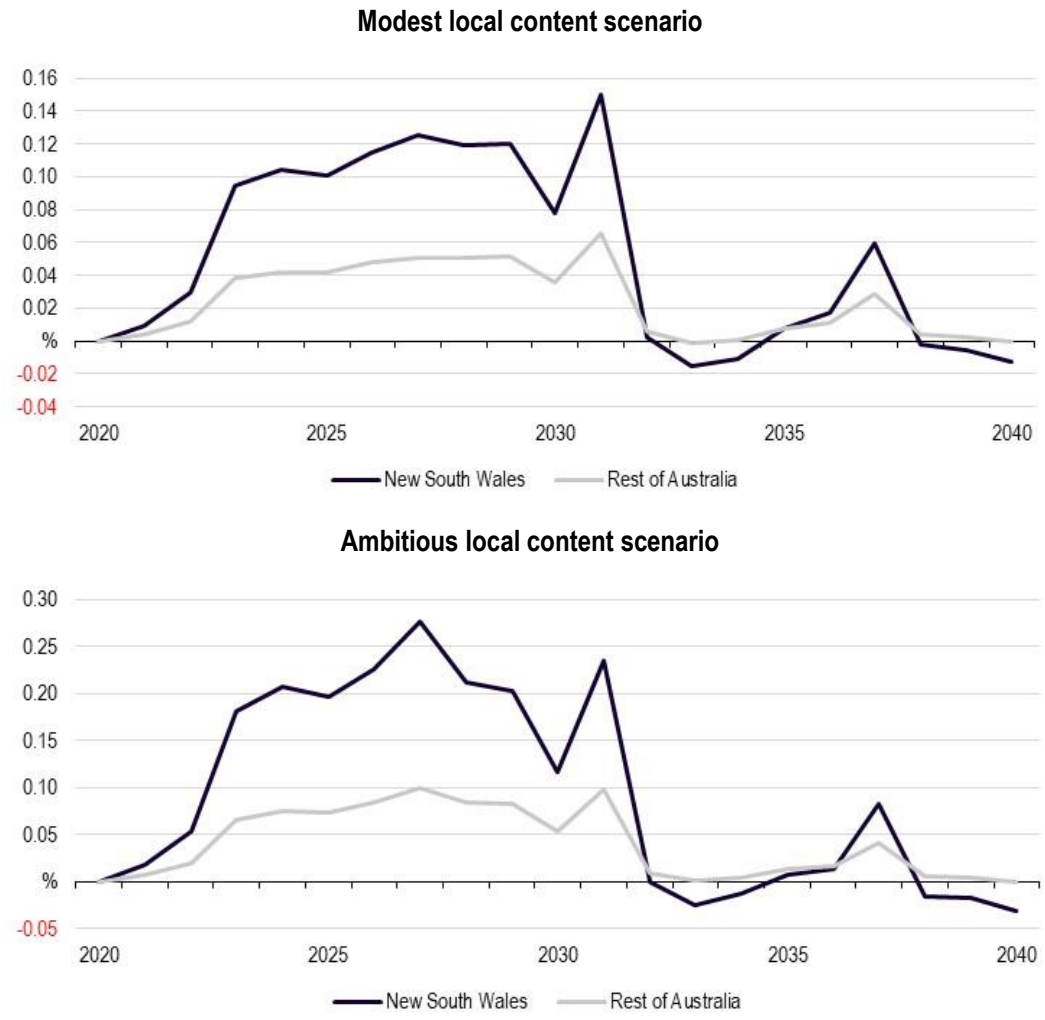
Figure 4.7 shows the projected changes in real wages in NSW and Australia as a result of the local content scenarios. The projected changes in real wages follow the changes in labour demand, with wages in each region acting to balance demand and supply in each region in each year. In addition, the magnitude of the projected changes in real wages is a function of the relative size of the demand and supply imbalance with respect to the overall size of the labour market (that is, large percentage increases in labour demand relative to the base case will tend to result in large percentage increases in real wages relative to the base case). In the context of increased local content, average real wages are also affected by the slightly higher average wages (including allowances) paid to direct employees compared to other industries.

As can be seen from Figure 4.7, there is a modest increase in the average real wages in both NSW and Australia overall as a result of the local content scenarios. As would be expected, the peak increase in real wages in each region occurs during the years when labour demand is the highest.

Over the period 2020-21 to 2040-41, real wages across NSW are projected to increase by an average of between 0.05 and 0.1 per cent relative to the base case under the modest and ambitious local content scenarios, respectively. While these increases may seem somewhat small, in the context of CGE models these are not insignificant changes as these increases reflect show how increases in local content in one sector drive increases in wages across the whole economy.

Given the size of the economy, the demand for goods and services from the rest of Australia over the period 2020-21 to 2040-41 has a much smaller impact on real wages paid in other regions, so average real wages across Australia overall increase by between 0.02 and 0.04 per cent relative to the base case under the modest and ambitious local content scenarios, respectively.

Figure 4.7 Projected change in real wages by region under the local content scenarios, relative to the base case (per cent)



Note: Real wages refer to wages adjusted for the effect of prices (inflation).
Source: ACIL Allen modelling.

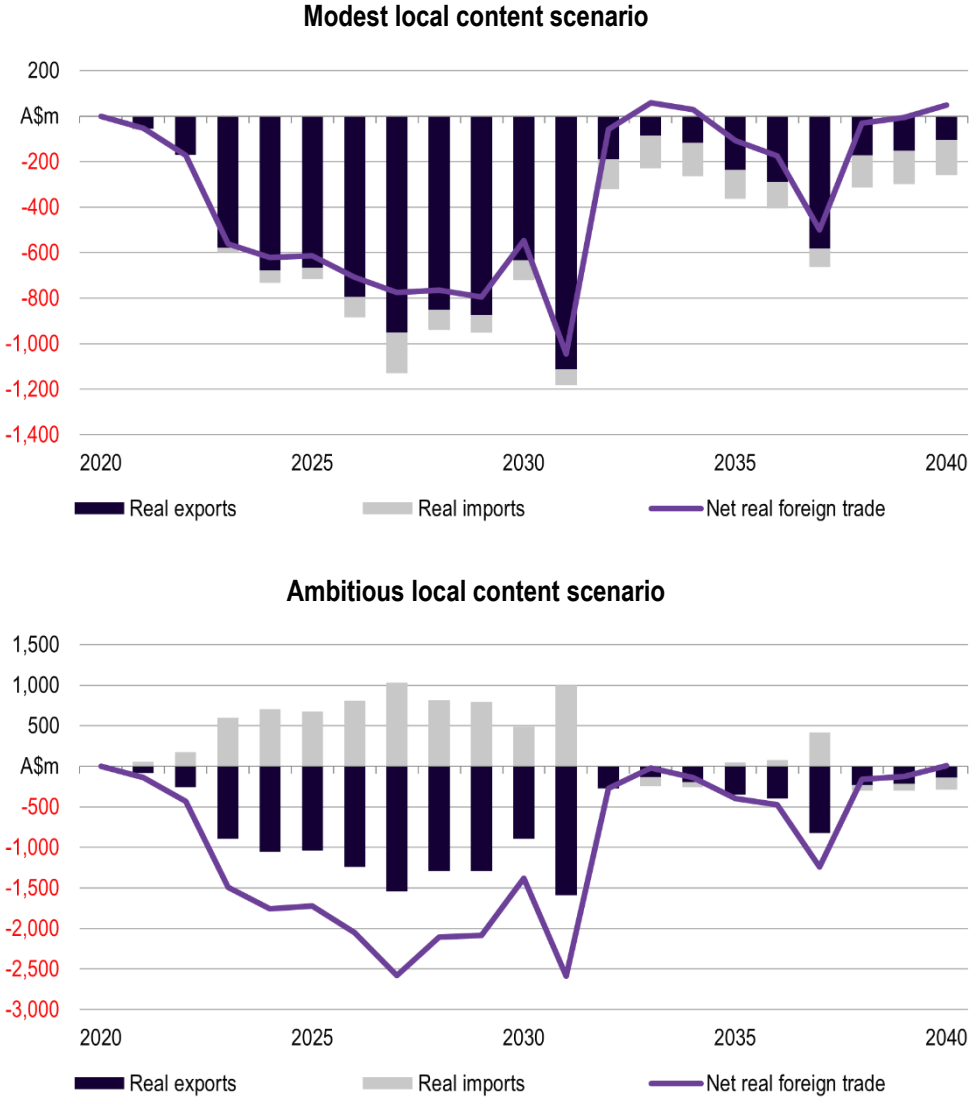
4.2.4 Foreign trade

Figure 4.8 shows the projected change in real net foreign trade (goods and services) due to the local content scenarios. As shown in this figure, it is projected that both local content scenarios will drive:

- A decrease in real imports as a result of the increased local content associated with the projected new investment under the modest local content scenario. While it is expected that there will be increases in demand for imports caused by the increased consumption associated with the higher real income of the economy, these effects are not enough to offset the reductions in imports in exchange for local content. In contrast, the higher local content requirements under the ambitious local content scenario causes a net increase in imports as the import reductions under this scenario are not sufficiently large to offset the increases in demand for imports caused by the increased consumption associated with the higher real incomes in the economy. As shown in Table 4.6, over the period 2020-21 to 2040-41:
  - the modest local content scenario is projected to decrease real imports of Australia by a cumulative total of $1.9 billion. The present value of this change is equivalent to a one-off decrease in real imports of $903 million
  - the ambitious local content scenario is projected to increase real imports of Australia by a cumulative total of $7.2 billion. The present value of this change is equivalent to a one-off decrease in real imports of $4.9 billion.
- A large decrease in real exports under both local content scenarios, which includes the effects of increases in the exchange rate and the shift of production away from exporting sectors and towards the projected new investment. In particular, over the period 2020-21 to 2040-41 the local content scenarios are projected to decrease real imports of Australia by a cumulative total of between $9.3 and $13.9 billion under the modest and ambitious local content scenarios, respectively (with a present value of between $5.6 and $8.5 billion).

In net terms, Australia is projected to have a trade deficit for most of the period of analysis.

Figure 4.8 Projected change in real net foreign trade (goods and services), relative to the base case (real FY2021 terms)



Note: Foreign trade is calculated as exports minus imports.

Source: ACIL Allen modelling.

Table 4.6 Projected change in real exports and imports as a result of the local content scenarios, relative to the base case (FY2021 AUD$m)

	Modest local content scenario				Ambitious local content scenario			
	Total	NPV3	NPV7	NPV10	Total	NPV3	NPV7	NPV10
Real exports	-9,297	-7,393	-5,632	-4,692	-13,946	-11,143	-8,534	-7,134
Real imports	-1,902	-1,355	-903	-687	7,214	6,049	4,865	4,181
Net real foreign trade [a]	-7,395	-6,038	-4,729	-4,005	-21,160	-17,192	-13,399	-11,315

	Modest local content scenario				Ambitious local content scenario			
	Total	NPV3	NPV7	NPV10	Total	NPV3	NPV7	NPV10

[a] Foreign trade is calculated as exports minus imports.

Source: ACIL Allen modelling.

4.2.5 Government revenues

NSW Government revenues will rise as a result of the local content scenarios. It is likely that some of the additional revenue will be returned to private households through slightly lower effective tax rates compared to the reference case, while the rest will be used to provide public goods and services.

Table 4.7 provides a summary of the anticipated total additional tax revenues projected to be generated as a result of the local content scenarios, while Figure 4.9 shows the changes in different revenue streams through time.

As shown in Table 4.7, the NSW Government is projected to benefit from higher revenues of between $265 and $463 million under the modest and ambitious local content scenarios, respectively. This includes:

- payroll taxes of between $180 and $301 million under the modest and ambitious local content scenarios, respectively
- indirect taxes (including a proportion of GST collected by the Commonwealth which will be distributed back to NSW[46]) of between $86 and $1162 million under the modest and ambitious local content scenarios, respectively.

The Australian Government is also projected to be a major beneficiary through higher collections of company tax and personal income tax. Indeed, personal income tax and company tax revenues over the period 2020-21 to 2040-41 are projected to be between $982 and $1,533 million[47] higher under the modest and ambitious local content scenarios, respectively (compared to the reference case).

In contrast, tax revenues for other states and territories are projected to decrease as a result of the economic activity discussed in previous sections.

Given the NSW's and Commonwealth's substantial budgetary challenges, the projected increases in tax revenues from the local content scenarios would make a positive contribution to the challenging fiscal outlooks of both governments.

Table 4.7 Cumulative projected change in real government tax revenues, relative to the base case (FY2021 AUD$m)

	Total (FY2021 to FY2041)	Net present value		
		3%	7%	10%
Modest local content scenario				
NSW payroll tax	180	149	118	101
NSW originated GST	86	79	69	62
Total NSW	265	228	187	162

[46] Distribution of Commonwealth GST between states is not hypothecated back to states based on their contribution of gross revenue, but rather is distributed based on a complex formula calculated by the Commonwealth Grants Commission taking into account revenue-raising capacity, 'disabilities' and expenditure needs.

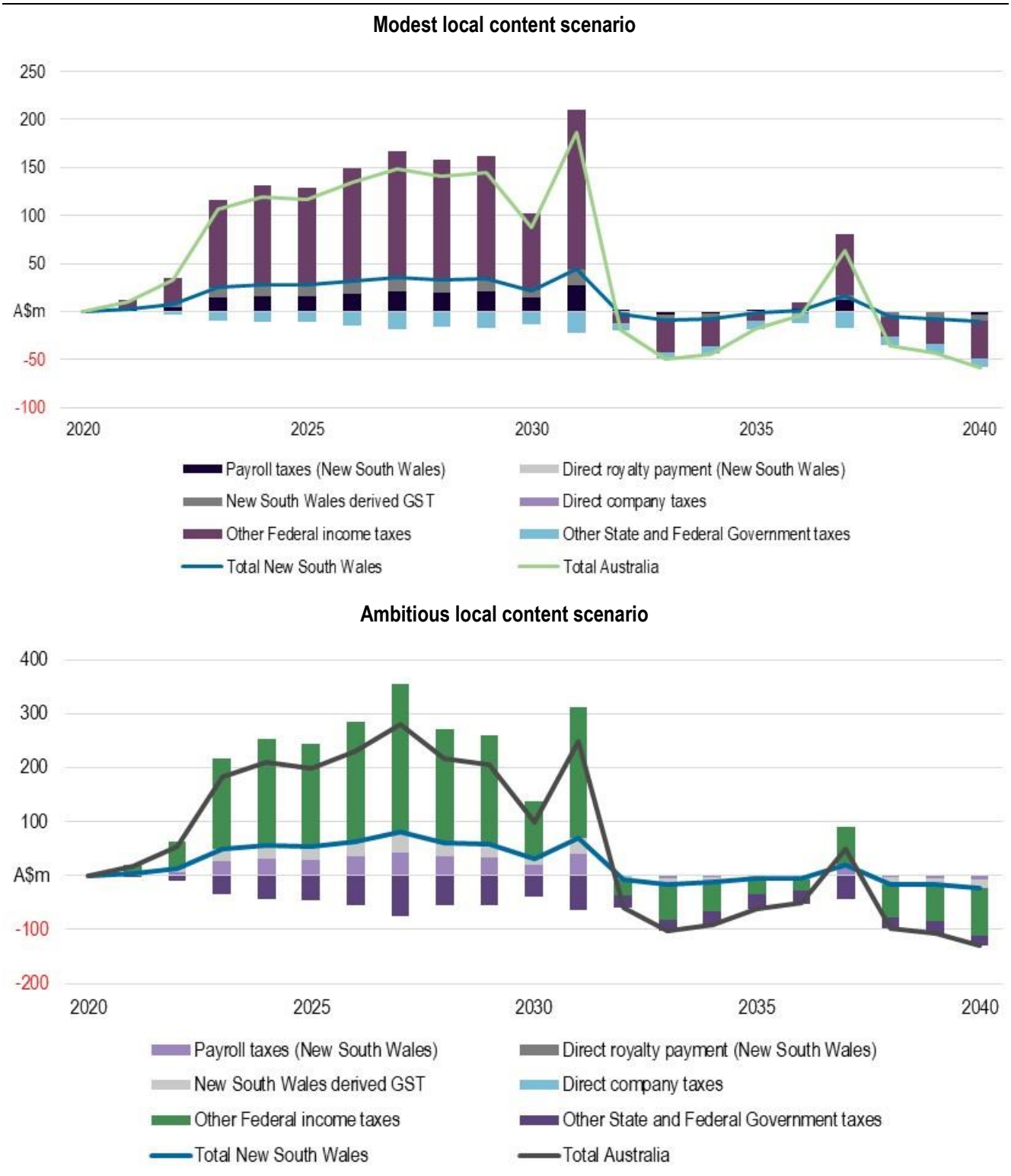
[47] This calculation is based on a company tax rate of 30 per cent with deductions and depreciation allowances as per the current taxation system.

	Total (FY2021 to FY2041)	Net present value		
		3%	7%	10%
Other Commonwealth Government income taxes	982	842	691	600
Other State and Federal Government taxes	-226	-171	-123	-99
Total Australia	1,021	898	754	663
Ambitious local content scenario				
NSW payroll tax	301	254	205	177
NSW originated GST	162	154	138	126
Total NSW	463	408	343	302
Other Commonwealth Government income taxes	1,533	1,365	1,160	1,027
Other State and Federal Government taxes	-705	-546	-404	-331
Total Australia	1,291	1,227	1,100	999

Note: GST revenues generated within the NSW economy may not all be transferred back to NSW. Similarly, a portion of Australian Government tax revenues may actually be transferred to NSW (either directly or indirectly). Tax revenues do not include taxes on the transfer of property.

Source: ACIL Allen modelling.

Figure 4.9 Projected change in real net foreign trade (goods and services), relative to the base case (real FY2021 terms)



Source: ACIL Allen modelling.

4.2.6 Industry results

The local content scenarios will have significant impacts on the level of activities in various industries in NSW and Australia overall. Specifically, compared to the base case, the increased local content would directly contribute to boosting the output in the manufacturing and construction sectors and indirectly stimulate output in industries upstream and downstream these sectors.

The varying effects of the local content scenarios on the real output of different industry sectors is outlined in Figure 4.10 and Table 4.8 . Real output is a measure of an industry's sales, which can include sales to final users in the economy or sales to other industries (intermediate inputs). Real output by industry is different to the change in real economic output for the economy as a whole (i.e. GDP). Real output is measured as the change in production of an industry excluding any price changes. Adding across industries double counts any sales by one business in the economy that are an input into other businesses. In contrast, real economic output at the economy-wide level removes any double counting by adding just the value added by each business (along with other taxes) and hence, is a better measure of the production of goods and services by the economy as a whole. As outlined in Box 4.1 value added consists of compensation of employees, taxes on production and imports, less subsidies, and gross operating surplus. Value added does not include intermediate inputs.

As shown in Figure 4.10 and Table 4.8, in NSW the biggest gains are concentrated in the manufacturing sectors under both scenarios. The overall increase in production in the manufacturing industries is mainly due to direct increases in local content in goods and services providing inputs into the projects, which lead to an increase in domestic demand for output from these sectors. Some of this additional demand leaks to the retail and wholesale trade sectors which are projected to experience a small increase in real output under both scenarios.

The construction services sector in NSW is projected to experience a decrease in output under the modest scenario and a significant increase under the ambitious scenario. The impacts on construction services are a result of two main effects:

— the first effect is a direct increase in demand for these services as a result of the increased local content

— the second round effect is a combination of reallocation of activity due to increased demand for labour from manufacturing sectors to produce the required inputs for the construction of the projects (which results in a decrease of output in construction as labour is drawn from this sector to manufacturing) and a price effect (increased wages and energy costs in NSW result in decreases in demand for these services from the NSW).

Under the modest scenario the second effect more than offsets the first effect, resulting in a decrease in construction services in NSW and an increase in construction services from the rest of Australia (some of the services previously bought from NSW are now being bought from other states as a result of the increased costs of these services in NSW). Under the ambitious scenario the direct increase in demand from the increase local content is significantly higher than under the modest scenario, leading to the first effect more than offsetting the second effect and resulting in increased output for construction services in NSW.

Other sectors in NSW are projected to experience decreases in output as a result of the crowding out effect (industries compete for limited amounts of local labour and as a result of this competition, wages increase and employment and output of some industries decrease).

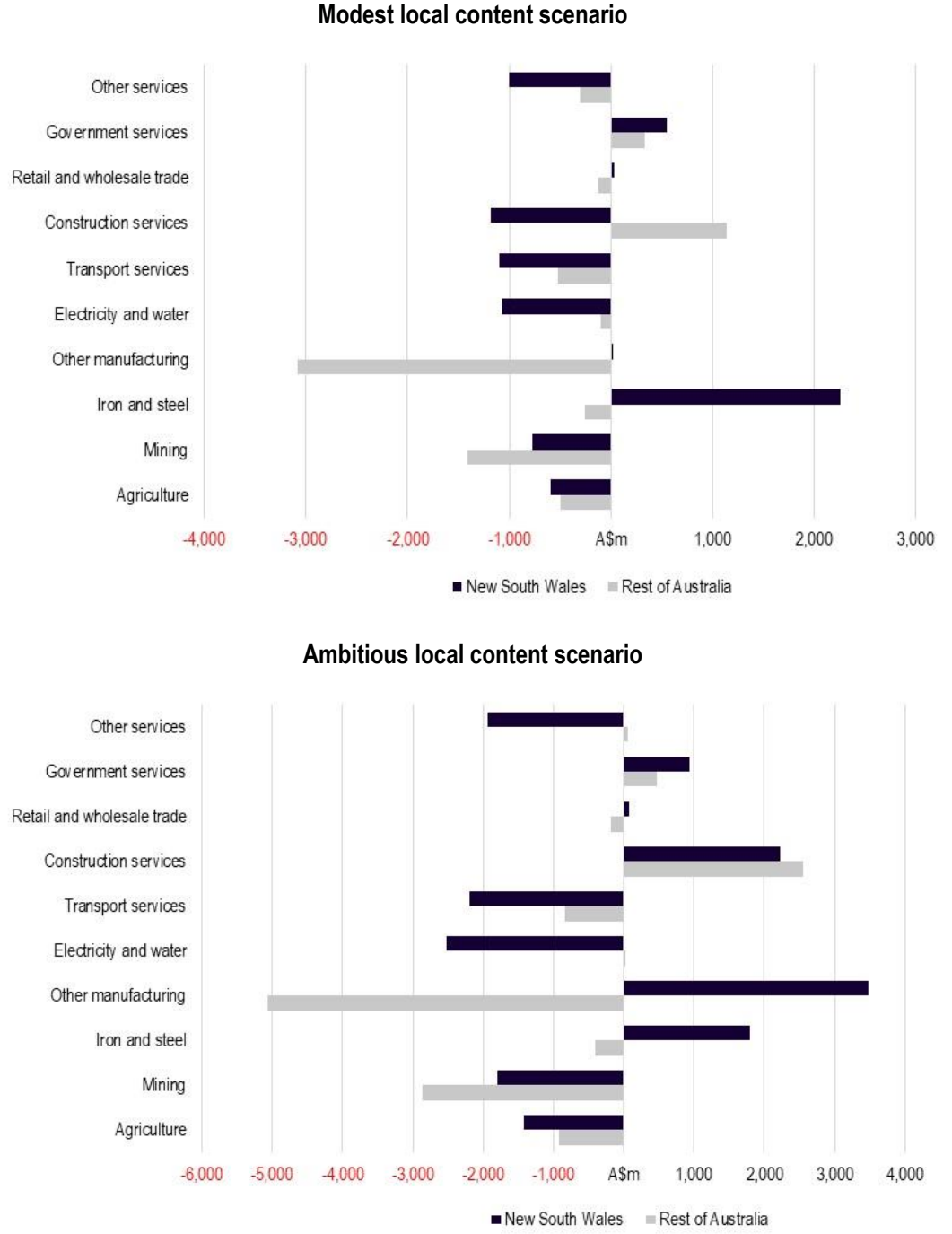
Across the rest of Australia, most industries are projected to experience decreases in output under the local content scenarios (except for construction and government services). For these sectors, the increased demand from the local content associated with the projected new investment diverts resources towards NSW and results in decreases in output and employment in other states and territories.

Table 4.8 Cumulative projected change in real output by industry, relative to the base case (FY2021 AUD$m)

Industry	Modest local content scenario		Ambitious local content scenario	
	Total (FY2021 to FY2041)	NPV7	Total (FY2021 to FY2041)	NPV7
NSW				
Agriculture	-589	-370	-1,416	-899
Mining	-776	-452	-1,801	-1,058
Iron and steel	2,259	1,432	1,795	1,142
Other manufacturing	17	131	3,472	2,518
Electricity and water	-1,079	-586	-2,519	-1,366
Transport services	-1,095	-666	-2,198	-1,349
Construction services	-1,177	-718	2,229	1,442
Retail and wholesale trade	28	61	77	153
Government services	555	368	939	641
Other services	-1,001	-627	-1,938	-1,244
Rest of Australia				
Agriculture	-492	-308	-922	-585
Mining	-1,413	-871	-2,865	-1,792
Iron and steel	-257	-161	-414	-264
Other manufacturing	-3,086	-1,971	-5,060	-3,289
Electricity and water	-99	-63	21	9
Transport services	-523	-320	-836	-517
Construction services	1,141	726	2,552	1,643
Retail and wholesale trade	-118	-61	-188	-102
Government services	336	223	462	308
Other services	-305	-117	65	185
Total Australia				
Agriculture	-1,081	-678	-2,338	-1,484
Mining	-2,189	-1,323	-4,667	-2,850
Iron and steel	2,002	1,271	1,381	878
Other manufacturing	-3,069	-1,840	-1,588	-771
Electricity and water	-1,178	-649	-2,498	-1,357
Transport services	-1,618	-986	-3,034	-1,866
Construction services	-35	9	4,781	3,085
Retail and wholesale trade	-90	-0	-112	51
Government services	891	591	1,401	950
Other services	-1,306	-744	-1,873	-1,058

Source: ACIL Allen modelling.

Figure 4.10 Projected change in industry output, relative to the base case in net present value terms (FY2021 AUD$m)



Source: ACIL Allen modelling.

4.2.7 Labour market sensitivity

As discussed in section 4.2.3, the projected economic impacts associated with the local content scenarios and the base case depend on the assumed availability of labour. In particular, the availability of labour has been allowed to change from the base case forecast as a result of the policy. This section analyses the sensitivity of the modelled impacts of fully constraining the labour market where the supply of labour nationally is unchanged with and without the local content policy, compared to the standard labour market assumptions in the CGE model.

The results are presented in Figure 4.11 and Table 4.9.

Figure 4.11 Labour market sensitivity – projected change in Australian real GDP and real income under the local content policy scenarios, relative to the base case

Source: ACIL Allen

Table 4.9 Labour market sensitivity – projected change in Australian real GDP and real income under different local content scenarios and labour market assumptions (FY2021 to FY2041), relative to the base case (FY2021 AUD$m)

	Modest local content scenario				Ambitious local content scenario			
	Standard Tasman Global (TG) labour market		Full constrained labour supply		Standard TG labour market		Full constrained labour supply	
	Total	NPV7	Total	NPV7	Total	NPV7	Total	NPV7
Real GDP	–34	200	–2,766	–1,550	263	675	–4,406	–2,394
Real income	2,510	2,146	–167	442	4,085	3,838	–517	837

	Modest local content scenario				Ambitious local content scenario			
	Standard Tasman Global (TG) labour market		Full constrained labour supply		Standard TG labour market		Full constrained labour supply	
	Total	NPV7	Total	NPV7	Total	NPV7	Total	NPV7

Source: ACIL Allen modelling.

As can be seen, the projected macroeconomic impacts results are sensitive to the assumed labour market environment. Notably, the projected impacts on Australian real GDP and real income are similar during the operations phase. However:

— The projected small real GDP benefits during the construction phase become negative if the labour market is fully constrained. Without the ability to increase the supply of scarce labour (either through increasing the participation rate or hours worked, or by reducing the unemployment rate), it is necessary to draw labour away from other value-adding operations in the economy.

— The projected real income benefits associated with the construction phase are still positive, but smaller. The positive effect on real incomes occurs because there is fundamentally more demand for local Australian labour under the modest and ambitious local content scenarios, relative to the base case.

These results highlight the sensitivity of the projected impacts to the flexibility of the labour market in response to the jobs stimulated by the local content policies. A key constraint to achieving the projected impacts under the standard Tasman Global (TG) labour market will be the availability of unemployed or underemployed workers with appropriate training around Australia to be placed into the relevant supply chains.

Beyond economics: the diverse impacts of local procurement

5

Local procurement can have a range of impacts. There is a lot of debate around the potential positive and negative impacts of local content policies on industry and the community in general. While many of these impacts were quantified through economic modelling, there are a range of impacts that are difficult to quantify either for their non-monetary nature or due to time and resource constraints for this project. These impacts are qualitatively discussed in this chapter.

5.1 Potential benefits of local procurement strategies

Some of the potential benefits of local content policies for infrastructure projects, identified in the literature[48], include the following.

- For industry:
  - fostering nascent industries by protecting them from foreign competition until they achieve latent competitive advantage
  - providing a means of maintaining a social licence to operate, by giving communities a stake in the project
  - reduced risk of operating stoppages and reliable access to critical supply by having suppliers located nearby.
- For communities:
  - Increasing local economic activity and job creation — the participation of local businesses in infrastructure projects is a means by which the benefits of these developments can flow into communities. However, as noted by Esteves and Barclay[49], 'the extent to which the local community will actually benefit from local procurement initiatives is dependent on the capacity of the community to supply goods and services to the project, on the extent to which there is a local multiplier effect and, even more importantly, on the ability of communities to adapt to the inevitable changes that accompany large-scale resource development'.
  - Increased participation of First Nation people and unrepresented groups.

[48] See for instance: Ana Maria Esteves & Mary-Anne Barclay 2011, *Enhancing the benefits of local content: integrating social and economic impact assessment into procurement strategies*, Impact Assessment and Project Appraisal, 29:3, 205-215; OECD 2015, *"Local-content requirements in the solar- and wind-energy global value chains"*, in Overcoming Barriers to International Investment in Clean Energy, OECD Publishing, Paris; Environment Victoria 2018, *Marking sure the renewable boom delivers for Victorians*, September; Barraket, J. & Weissman, J. 2009, *Social Procurement and its Implications for Social Enterprise: A literature review*, Brisbane; Social Procurement Australasia n.d., *Social Procurement: The Business Case*; Social Procurement Australasia 2015, *Insights into social procurement: from policy to practice.*

[49] Ana Maria Esteves & Mary-Anne Barclay 2011, *Enhancing the benefits of local content: integrating social and economic impact assessment into procurement strategies*, Impact Assessment and Project Appraisal, 29:3, 205-215, p. 206.

- Learning spillovers — these spillovers include, for instance, local training, technology transfer and knowledge and innovation to other market participants through learning by doing and capacity building.
- Economic diversification by creating business linkages locally.
- Increased national and international investment in domestic manufacturing and increased manufactured exports — for example:
  - A report by Environment Victoria[50] argues that the local content and apprenticeship requirements in the Victorian Renewable Energy Auctions have led to manufacturing companies across Victoria investing in their facilities and increasing their workforce. The report cites several examples of companies that have invested to expand their facilities in response to demand driven by the local content requirements in the Victorian Renewable Energy Target (VRET). These include cable company Nexans Olex which has invested $10 million in their Lilydale facility to meet demand for cables, wind tower manufacturer Keppel Prince which invested $2 million to double their production capacity to meet the demand from the RET and the first round of the VRET auction and Wilson Transformer Company which invested $10 million upgrading its Wodonga facility.
  - An OECD investor survey[51] of leading companies involved across the solar-PV and wind-energy value chains conducted in 2014 found that local content requirements had encouraged 29 per cent of international investors across the value chain to invest in local manufacturing or to source their inputs locally.
  - On a roundtable consultation by the OECD with public and private stakeholders in 2013 on achieving a level playing field for international investment in solar and wind energy[52], some manufacturers operating in several countries argued that local content requirements can help to attract international and domestic investment in large markets or regional hubs, especially when these requirements are backed by large tenders and ambitious development goals. These investors also noted that local content requirements can also support technology transfer and create local jobs. Conversely, other manufacturers in the roundtable expressed the view that local content requirements are not suited for small- and medium-sized countries and are inefficient in the long-run. Representatives from downstream power generation companies argued that these requirements may reduce their cost competitiveness and result in distorted competition and reduced technology transfer and innovation.
- Increased local ownership and control of manufacturing capacity.
- Greater deployment of solar and wind energy in support of climate change mitigation.
- Attraction of investment in social infrastructure.

— For governments:
  - improved public acceptance of policy support to renewable energy
  - increased tax base due to a larger manufacturing industry.

5.2 Potential negative impacts of local procurement strategies

Some of the potential negative impacts or unintended consequences of local content policies for infrastructure projects identified in the literature[53] include the following.

— Increased overall costs of developing and operating infrastructure as local content requirements require firms to purchase more expensive or less efficient resources. Reduced

[50] Environment Victoria 2018, *Marking sure the renewable boom delivers for Victorians*, September.

[51] OECD 2015, *"Local-content requirements in the solar- and wind-energy global value chains"*, in Overcoming Barriers to International Investment in Clean Energy, OECD Publishing, Paris.

[52] Ibid.

[53] See for instance: Ana Maria Esteves & Mary-Anne Barclay 2011, *Enhancing the benefits of local content: integrating social and economic impact assessment into procurement strategies*, Impact Assessment and

imports and competition in the short run between domestic manufacturers and foreign competitors can also delay economies of scale and prevent cost reductions for manufacturers.

- Increased electricity prices in the short-term to offset increased costs of developing and operating infrastructure.
- Reduced innovation and technology transfer — evidence on wind projects from Brazil, China and Ukraine reported by the OECD suggests that local content requirements 'can hinder competitiveness, technology transfer and investment in wind energy, especially in the absence of sufficient technological capability, market size and financial support'[54]. In particular, the OECD notes that:
  - Brazil's local content requirement policy incentivised the domestic production of low- and medium technology content, but not of high-technology components of wind turbines. It was noted that producers of wind energy source locally heavy parts (which are difficult to transport) and parts of the nacelle, hubs and blades, but that they continue to import expensive components with high-technology-content and high-quality jobs.
  - In China, evidence from several studies shows that local content requirements helped to develop the country's nascent wind turbine manufacturing industry from 2003 until 2019-10. However, these requirements deterred higher quality imports from more experienced foreign wind-energy producers and resulted in foreign manufacturers leaving the Chinese market after 2003, reducing opportunities for continued technical and operational improvement and limited quality improvement of Chinese wind turbines. Evidence also shows that the removal of local content requirements in China's mature wind-energy sector in 2011 has encouraged technology transfer through imports of higher quality products. This demonstrates the benefits of removing local content requirements once the industry matures.
  - In Ukraine, the increasingly stringent local content requirements have been difficult to implement and have hindered international investment in wind energy. This is because Ukraine lacks industrial capability and local manufacturers able to produce relevant wind-turbine equipment.
- Drain from other sectors of the economy — an unintended consequence of local content requirements could be drawing local people away from other businesses in the area to the development, resulting in shrinking of the services sector, which in many cases is already limited in these communities.
- Increased risks, including:
  - Of perverse behaviour — for instance, increasing the risk of 'fronting', where companies are established with the prescribed local ownership, but the decision- making and benefits are held by other individuals, who are not targeted beneficiaries of the local procurement policy .
  - Higher technology risk in the short-run for downstream firms forced to switch to less-known local technologies.
  - Higher revenue risk for downstream firms in the short-run since the potential for governments to adopt local content requirements makes the cost of components, and therefore profits, less predictable.
- Increased policy uncertainty and investment risk — for example, the OECD investor survey of companies involved across the solar-PV and wind-energy value chain mentioned above[55] showed that an important proportion of the surveyed international investors concurred that

Project Appraisal, 29:3, 205-215; OECD 2015, *"Local-content requirements in the solar- and wind-energy global value chains"*, in Overcoming Barriers to International Investment in Clean Energy, OECD Publishing, Paris.

[54] OECD 2015, *"Local-content requirements in the solar- and wind-energy global value chains"*, in Overcoming Barriers to International Investment in Clean Energy, OECD Publishing, Paris, p. 63.

[55] Ibid.

local content requirements negatively impacted their company's activities in solar-PV and wind-energy markets. This survey found that these types of policies resulted in:

  - higher investment risk and uncertainty
  - increased cost of intermediary inputs for downstream installations and services
  - discouraging international investors from investing in renewable-energy plants.

- Community dissatisfaction if only menial works are being given to local people. Furthermore, social cohesion can be negatively affected if there are perceptions that particular groups have been favoured in the allocation of business opportunities.
- Dependence and increased vulnerability for Small and Medium Enterprises that are part of the development's supply chain if the developer/operator is their sole, or major, client. These companies can be left vulnerable to the business cycles of the larger company and there may be little in the way of opportunities for diversification.

Practical implications for establishing local content requirements

6

During the course of the project, two workshops were conducted to consult with stakeholders – one with developers on 25 November 2021 and one with engineering, procurement and construction (EPC) contractors on 30 November 2021. The purpose of the workshops was to seek advice on the practical implications of:

— potential local content requirements and underpinning assumptions

— policies and signals required to generate investment in the local supply chain.

The workshops were attended by representatives from the organisations set out in Table 6.1 as well as representatives from the Department, the Consumer Trustee and the Renewable Energy Sector Board.

Table 6.1 Attendees at workshops to discuss the potential local content requirements

Developers	EPC contractors
Edify Energy Australia	Elecnor
Iberdrola Australia	Downer Group
Neoen	GE Renewable Energy
RES Group	Vestas Australia
UPC Renewables Australia	BECA

Source: ACIL Allen

Views from workshop participants were specifically sought on:

— substituting imported content with local content

— workforce participation

— the cost assumptions for the economic modelling.

Workshop participants also provided comment on the specification of, and reporting on, any local content requirements.

This chapter provides an overview of the views expressed by participants in the workshop.

6.1 Substituting imported content with local content

Workshop participants identified that some of the materials that will be used to build the projected new infrastructure to modernise the NSW electricity system are highly specialised and cannot be readily substituted with local content, but other imported materials could be more readily substituted

with local content. The imported content that was identified by workshop participants as being more readily substitutable included:

— steel, although it was noted that there were currently no testing stations in Australia, with steel sent to China for testing
— steel racking
— wind turbines and towers
— network augmentations, noting that Wilson Electric Transformers is currently broadening its locally manufactured product range to meet demand
— labour.

Workshop participants were of the view that a significant scale up of local content would require industry development. However, they advised that Australia is part of a global market with global suppliers seeking to invest where it is most favourable to do so. Additionally, investment by suppliers in other countries could render investment in Australia less attractive.

They advised that when choosing where to invest, global suppliers will consider the local market as well as export opportunities. Australia can't compete on the global market so any facilities established in Australia would be for local use only.

There was some discussion during the workshops of a "chicken and egg" situation.

New facilities will not be established unless there is sufficient certainty of a sustainable market over the longer term, with the legislation in and of itself not considered to provide sufficient certainty to invest.

There are previous examples of the boom and bust cycle where facilities have been established locally to meet an increase in demand but shut down when demand declined, for example, Vestas established:

— a nacelle factory in Wynyard, Tasmania which opened in late 2003 but closed in 2006
— a blade factory in Portland, Victoria which opened in 2005 but closed in 2007.

There have been numerous reports over the years that Keppel Prince Engineering would need to downscale, mothball or close its wind turbine manufacturing facility in Portland Victoria due to a lack of demand.[56]

The workshop participants advised that local manufacturers need to have an established track record before EPCs are prepared to use their product. For example, one EPC requires local manufacturers to be certified before proposing them as a subcontractor in any tender. To be certified, the local manufacturer needs to demonstrate that the delivery timeline risk is manageable and the project will be bankable for the EPC contractor. Factors identified by workshop participants that influence the delivery timeline risk and bankability of the project include:

— capacity – ability to meet the throughput required
— quality
— ability to support operation and maintenance in the long term
— ability to provide performance guarantees
— ability to meet design requirements, noting that the design requirements will differ by original equipment manufacturer (OEM)

[56] For example, https://www.theage.com.au/national/victoria/150-regional-jobs-on-line-in-wind-farm-stoush-over-chinese-steel-20210219-p5743a.html and https://reneweconomy.com.au/keppel-prince-closes-wind-manufacturing-after-abbott-targets-ret-62707/

— ability to meet AEMO's technical requirements, noting that only a small number of manufacturers are currently able to meet these for some components

— demonstrated experience.

Workshop participants were generally of the view that established players in the market were more likely to be able to meet these requirements than new players, although there was a possibility that existing operators with similar processes may be able to meet these requirements, for example, manufacturers of high pressure vessels.

Some workshop participants noted the time that it would take to establish local facilities. It was estimated that at least 12-18 months was required to establish local manufacturing facilities in a pre-existing factory once a final investment decision had been made.

One additional practical issue that was raised was the availability of suitable transport corridors between the local manufacturing facility and the project site.

6.2 Workforce participation

Workshop participants were generally confident that participation by learning workers, apprentices and First Nations people could be increased if there was a sustained workload over a long period of time, but questioned whether there would be the demand for labour post 2030. It was noted that projects are increasing in size and extending over time which facilitates a more continuous workload.

However, they were of the view that the renewable energy industry would need to be able to collaborate more to facilitate the mobility of skills between players and across different locations. They noted that the needs of industry could be pooled through group training schemes.

Workshop participants noted that some of the skills that are needed are widely available but others are niche. There are some skills that are not attractive (such as blasting) and as a consequence it is difficult to recruit these skills locally.

Workshop participants also noted that early meaningful engagement was the key to increasing the participation by First Nations people but the success depends on the employment rate in the local area.

6.3 Cost assumptions for economic modelling

Workshop participants were generally of the view that the cost assumptions that had been made for the purposes of the economic modelling were in the right order of magnitude, although some participants were of the view that the cost premia assumed were on the high side.

6.4 Specification of, and reporting on, local content requirements

Workshop participants noted that the local content requirements could be specified in terms of the percentage of market value of a project, the percentage of expenditure (either capital or capital and operating and maintenance) or addressable value, noting that some imported components could not reasonably be substituted with local components. Regardless of the approach, the workshop participants support flexibility in the specification of any local content requirements, particularly in circumstances where the local industry does not have the capacity to deliver to meet the requirements.

Workshop participants also noted that local content comes at a cost. There was some concern as to how one offer with lower local content at a lower cost would be compared with an offer with higher local content at a higher cost.

Examples of reporting against local content requirements were provided by participants – a range of measures could be used with reporting as frequently as monthly based on cost or number of hours. Workshop participants noted that a carrot or stick approach could be used to enforce compliance with any local content requirements. A carrot approach was considered to be preferable.

Willingness to pay customer research 7

This chapter presents the results from the customer research that was undertaken to assess the willingness of NSW electricity customers to pay for increased local content in the delivery of the new electricity infrastructure to modernise the NSW electricity system. The relative importance of attributes associated with modernising the NSW electricity system is discussed in section 7.1 and the estimated willingness to pay is discussed in section 7.2.

More detailed analysis on the relative importance of attributes associated with the modernisation fo the NSW electricity system is provided in Appendix I as well as an overview of the key socio-demographic characteristics of the sample.

7.1 Relative importance of attributes associated with modernising the NSW electricity system

Survey participants were asked to rate the importance of the following attributes associated with modernising the NSW electricity system on a five point scale from very important to not important:

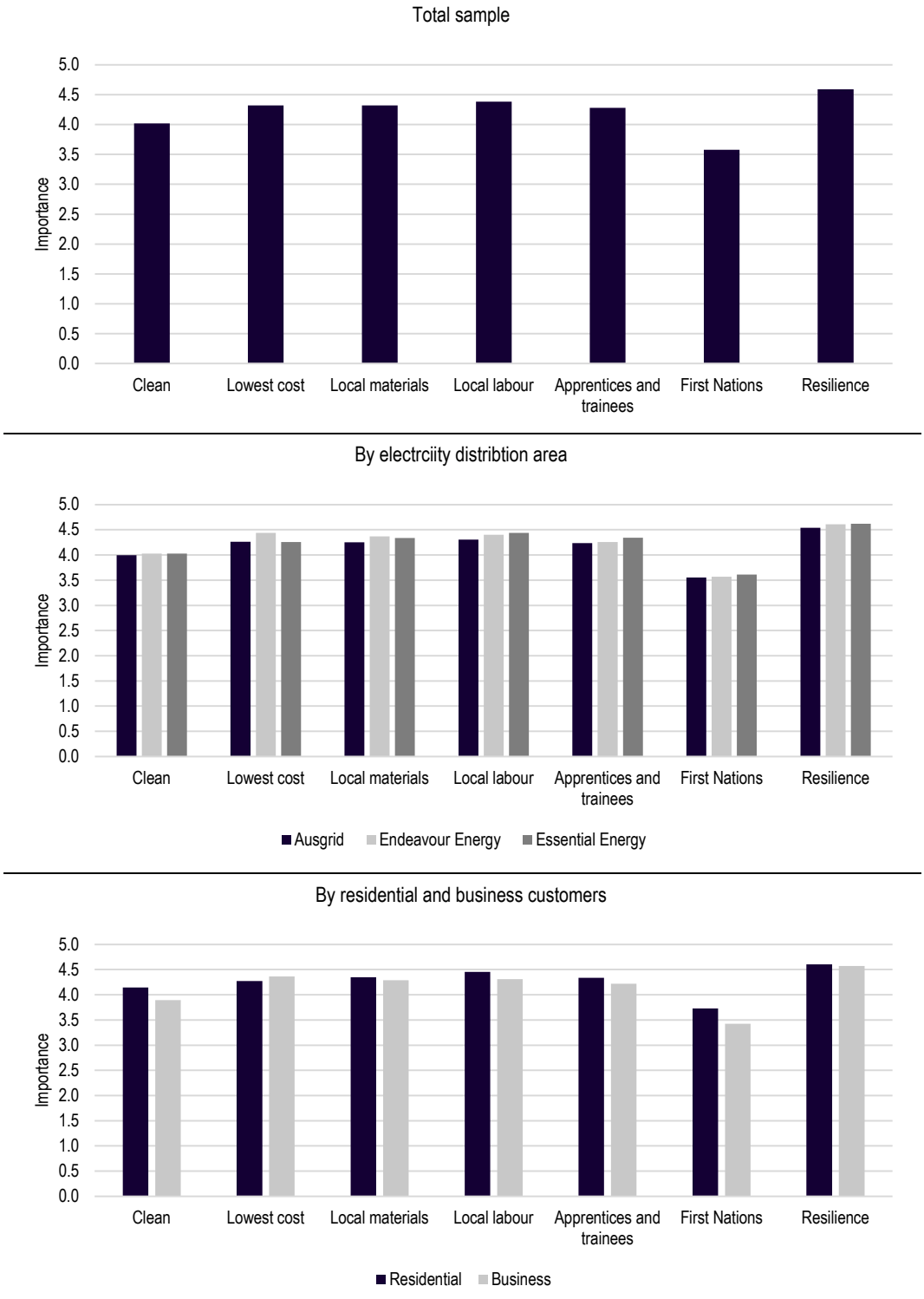
- the NSW electricity system is transformed so that it is clean (clean)
- the NSW electricity system is transformed at the lowest cost for consumers (lowest cost)
- the NSW electricity system is transformed using as much locally produced materials as possible (local materials)
- the NSW electricity system is transformed using as much labour from the local area as possible (local labour)
- apprentices and trainees contribute to transforming the NSW electricity system (apprentices and trainees)
- First Nations people contribute to transforming the NSW electricity system (First Nations)
- Australia builds local manufacturing capacity to improve its resilience (resilience).

The relative importance of each of these attributes is illustrated in Figure 7.1. The attribute that was rated as the most important was to build local manufacturing capacity to improve resilience with an average rating of 4.6. It was rated as the most important by participants in each electricity distribution area, and by residential and business participants.

The importance of four attributes were rated similarly with an average score of 4.3 or 4.4 – lowest cost, using local materials, using local labour and using apprentices and trainees. Participants in Endeavour Energy's electricity distribution area rated lowest cost and local materials as slightly more important than participants in the other electricity distribution areas, and participants in Essential Energy's area rated local labour and contribution by apprentices and trainees as slightly more important than participants in the other electricity distribution areas. Business participants rated lowest cost as slightly more important than residential participants, while residential

participants rated local materials, local labour and apprentices and trainees as slightly more important than business participants.

Figure 7.1 Relative importance of attributes associated with modernising the NSW electricity system



Source: ACIL Allen

Of the seven attributes tested, transforming the NSW electricity system so that it is clean was rated as the second least important with an average score of 4.0. The rating of the importance of a clean electricity system was similar across each of the electricity distribution areas, but residential

participants rated a clean electricity system as slightly more important than business participants (4.1 compared to 3.9).

The attribute that was rated the least important of the seven tested was participation by First Nations people with an average score of 3.6. The rating of importance was similar across each of the electricity distribution areas, but residential participants rated the participation of First Nations people as slightly more important than business participants (3.7 compared to 3.4).

Further detail on the survey results is provided in Appendix I.1.

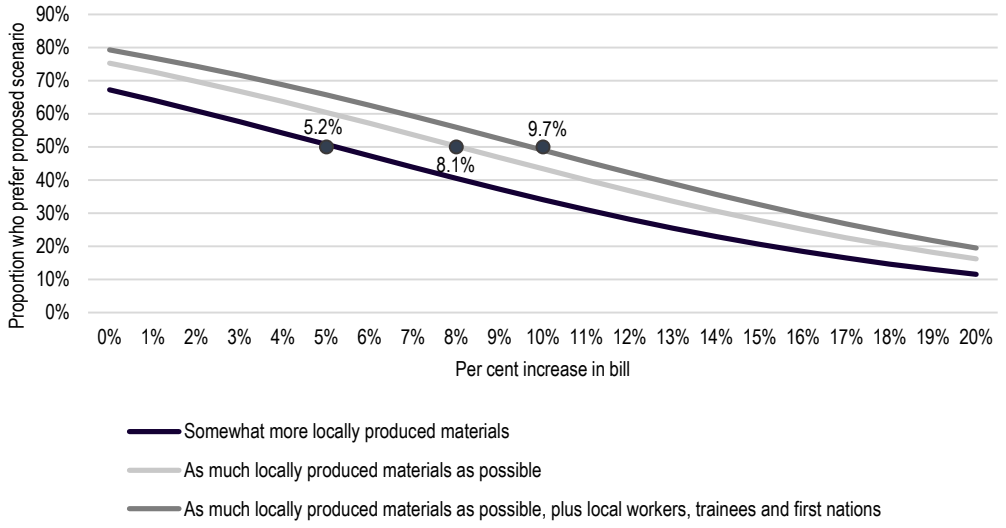
7.2 Willingness to pay for increased local content

The willingness of the survey participants to pay for increased local content was estimated by asking participants to compare a baseline level of local content (new electricity infrastructure built at the lowest cost) with a higher level of local content. Willingness to pay curves, which show the proportion of respondents willing to pay for increased local content, against a range of prices were developed using logit regressions. The coefficients for each level of each attribute were estimated to be able to assess the key determinants of the willingness to pay.

Two main regression functional forms were analysed in detail, with one main difference – the inclusion or exclusion of a cost squared term. The model did not find the cost squared term to be of significant predictive power, indicated by a relatively high p-value. Additionally, the inclusion of the cost squared term produced illogical results when looking at cost increases in excess of 10 per cent. This is most likely due to the relatively small range of cost impacts included in the survey, specifically bill increases of between 0 and 8 per cent. Accordingly, we excluded the cost squared term from the final logit regression.

Figure 7.2 illustrates the willingness by the survey participants to pay for increased local content. Survey participants indicated that they are willing to pay, on average, 5.2 per cent more for somewhat more locally produced materials, 8.1 per cent more for as much locally produced materials as possible, and 9.7 per cent more for as much locally produced materials as possible as well as more local workers, contribution by apprentices and trainees, and participation by First Nations people.

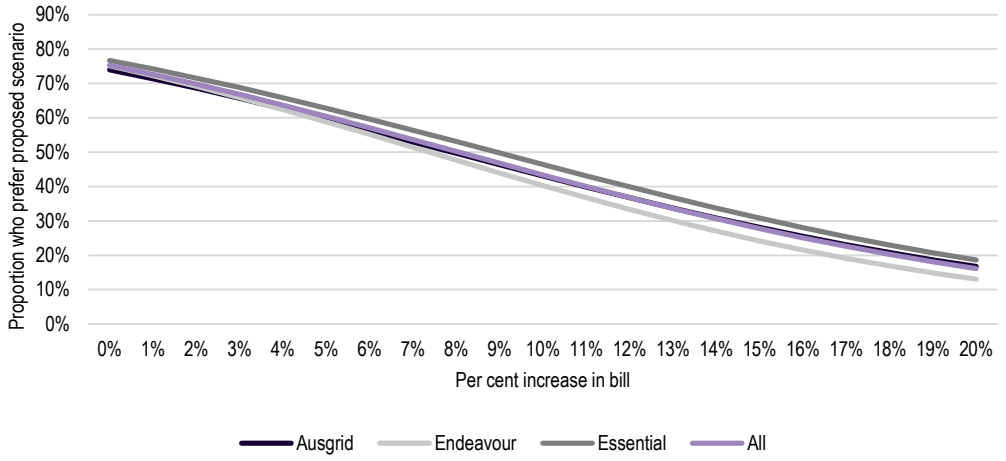
Figure 7.2 Willingness to pay for increased local content



Source: ACIL Allen

Figure 7.3 illustrates how the willingness to pay curves vary by electricity distribution area for using as much locally produced materials as possible. The willingness to pay is not materially different across electricity distribution areas, although it is slightly lower in Endeavour Energy's area (7.4 per cent) and slightly higher in Essential Energy's area (8.9 per cent).

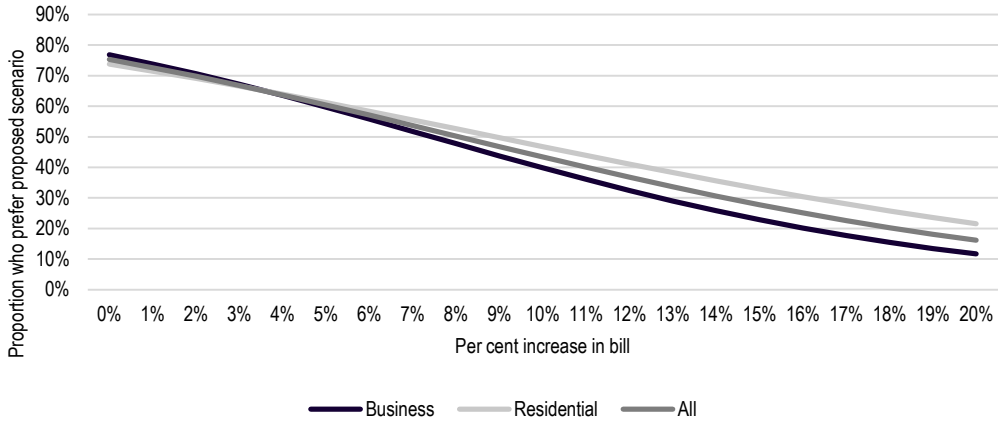
Figure 7.3 Willingness to pay for increased local content, by electricity distribution area



Source: ACIL Allen

Figure 7.4 illustrates how the willingness to pay curves vary by customer type for using as much locally produced materials as possible. The willingness to pay is similar for residential and business participants, although it is slightly lower for business participants (7.4 per cent) than for residential participants (8.9 per cent).

Figure 7.4 Willingness to pay for increased local content, by customer type



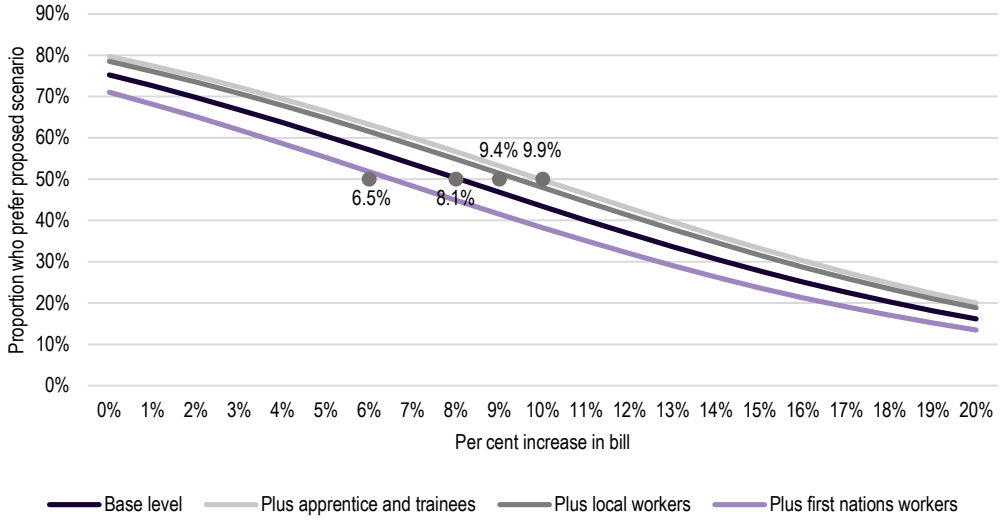
Source: ACIL Allen

While Figure 7.2 illustrates the willingness to pay to use as much locally produced materials as possible as well as more local workers, contribution by apprentices and trainees, and participation by First Nations people, Figure 7.5 disaggregates the impact of more local workers, contribution by apprentices and trainees, and participation by First Nations people on the willingness to pay. Figure 7.5 illustrates that:

- increasing the contribution by apprentices and trainees to transform the NSW electricity system in addition to using as much locally produced materials as possible increases the willingness to pay from 8.1 per cent to 9.9 per cent
- increasing the use of labour from the local area to transform the NSW electricity system in addition to using as much locally produced materials as possible increases the willingness to pay from 8.1 per cent to 9.4 per cent
- increasing the participation by First Nations people to transform the NSW electricity system in addition to using as much locally produced materials as possible decreases the willingness to pay from 8.1 per cent to 6.5 per cent.

These relative impacts are consistent with the relative importance that participants place on using more local workers, apprentices and trainees and First Nations people, as discussed in section 7.1.

Figure 7.5 Willingness to pay for more local workers, contribution by apprentices and trainees and participation by First Nations people



Source: ACIL Allen

Other than the participation by First Nations people, the estimated willingness to pay for increased local content in transforming the NSW electricity system, for participants in each electricity distribution area and for residential and business customers, exceeds the estimated increase in the electricity bill under both the modest local content scenario and the ambitious local content scenario (as illustrated in Figure 3.5).

Conclusions and recommendations 8

The costs associated with increasing local content are discussed in section 8.1. The modelling and analysis of increased local content indicates that, based on the assumptions that have been used, increasing local content will, in the period to 2040-41:

— increase real economic output, as discussed in section 8.2

— increase real income, as discussed in section 8.3

— increase employment, as discussed in section 8.4.

The estimated impact of increasing local content on retail electricity bills is less than customers have indicated that they are willing to pay, as discussed in section 8.5.

While there are benefits associated with increasing local content, and customers have indicated they are willing to pay, there are a number of practical implications that need to be considered when introducing any requirements for local content. These are discussed in section 8.6.

Section 8.7 recommends how the actual costs and benefits of the local content can be assessed following the development phase.

8.1 Costs associated with increasing local content

Increasing local content requires additional investment in new facilities, during the development phase and during the operating and maintenance phase, as summarised in Table 8.1. The total additional cost associated with the modest local content scenario is $1.9 billion and with the ambitious local content scenario is $4.7 billion (discounted to 2021).

Table 8.1 Total additional costs associated with the local content scenarios (in 2021 dollars)

	Modest local content scenario	Ambitious local content scenario
New facilities	$0.0 billion	$0.1 billion
Development phase	$1.6 billion	$4.1 billion
Operating and maintenance phase	$0.2 billion	$0.6 billion
Total	**$1.9 billion**	**$4.7 billion**

	Modest local content scenario	Ambitious local content scenario

Note: Investment discounted to 2021 using the discount rates in Table 2.9

Source: ACIL Allen analysis

8.2 Increasing local content will increase real economic output

The local content scenarios will have two effects:

— an investment effect during the construction phase (where local economic activity increases as a result of the projects)

— a price effect during the operational phase (where the costs of the local content scenarios will be passed through to consumers in the form of increased energy prices).

The investment effect from an increase in local content associated with the projected new investment is projected to lead to an increase in real output in the NSW economy and a decrease in real output in the rest of the Australian economy under both local content scenarios. The decrease in output across the rest of Australia is driven by the redirection of economic activity from these states and territories to NSW. These effects are offset by the effect of increases in energy prices which lead to a decline in demand for goods and services in the NSW economy as residents have less income to spend in these other sectors. While the increase in energy prices lowers demand in NSW, it increases output across the rest of Australia as some economic activity relocates to other states with lower relative energy prices.

The net impact of these two effects is (relative to the base case):

— an increase in real economic output in NSW (i.e. real GSP) by a cumulative total of between $683 million and $1.7 billion under the modest and ambitious local content scenarios, respectively (with a net present value of between $544 million and $1.3 billion). This reflects the fact that, while the price effect decreases real output in NSW, this decrease is not enough to offset the local content investment effect, resulting in an overall gain in GSP over the analysis timeframe

— a small decrease in real economic output in Australia as a whole (i.e. real GDP) by a cumulative total of $34 million under the modest local content scenario. However, in net present value terms, it is projected that the modest local content scenario will result in an increase of $200 million in GDP. This 'discrepancy' is explained by the timing of the positive and negative impacts of the scenario, with the increases in GDP happening earlier in the period of analysis and the decreases happening later in the period, which results in a net increase in GDP in present value terms

— a cumulative increase in Australia's GDP of $263 million under the ambitious local content scenario (with a net present value of $675 million).

To place these projected changes in economic output in perspective:

— the discounted present value (using a 7 per cent discount rate) of the change in NSW output is equivalent to between 0.1 per cent and 0.2 per cent of NSW's current GSP under the modest and ambitious local content scenarios, respectively

— the discounted present value (using a 7 per cent real discount rate) of the change in national output is equivalent to between 0.01 and 0.03 per cent of Australia's current GDP.

The increase in real economic output is compared to the additional investment for each of the local content scenarios in Table 8.2. If lower cost premia for local content had been assumed, the total additional investment associated with the local content scenarios would have been lower, but the

investment effect on GDP would also have been lower, although this would have been offset by a lower price effect.

Table 8.2 Estimated additional investment and increase in real economic output associated with the local content scenarios (in 2021 dollars)

	Modest local content scenario	Ambitious local content scenario
Total additional investment	$1.9 billion	$4.4 billion
Increase in real economic output		
Australia	$0.2 billion	$0.7 billion
New South Wales	$0.5 billion	$1.3 billion

Note: Investment discounted to 2021 using the discount rates in Table 2.9

Source: ACIL Allen analysis

8.3 Increasing local content will increase real income

The extent to which the NSW residents will benefit from the additional economic activity produced by increasing the local content associated with the projected new investment depends on the level of domestic ownership of the capital utilised in the projects, wealth transfers undertaken by the NSW Government as a result of the taxation revenues generated by the project and trade effects.

Given that a significant proportion of the potential employees for the development will be sourced locally, this will provide a significant boost to local incomes. However, as a proportion of the projects are assumed to be owned by overseas shareholders, a portion of the wealth generated by the economic activity is transferred outside of Australia.

The NSW Government will receive additional taxes derived from the developments and these taxes will be spent within the NSW economy. The additional demand for capital and labour stemming from the projects would also result in an improvement of the terms of trade relative to the base case. Overall, in net terms it is projected that the change in income resulting from increasing local content associated with the projected new investment will be significantly higher than the change in economic output.

More specifically, over the period 2020-21 to 2040-41, the increase in local content is projected to (relative to the base case):

- increase the real income of NSW by a cumulative total of between $2.6 and $5.0 billion under the modest and ambitious local content scenarios, respectively. The present value of this change is equivalent to a one-off increase in real income of between $2.1 and $4.2 billion under the modest and ambitious local content scenarios, respectively
- reduce the real income of other states and territories (rest of Australia) as a result of the pull of activity towards NSW. While the rest of Australia will benefit somewhat from the price effect through terms of trade gains, these are not enough to offset the reductions in demand due to the local content effect
- increase the real income of Australia as a whole by a cumulative total of between $2.5 and $4.1 billion, under the modest and ambitious local content scenarios, respectively (with a net present value of between $2.1 and $3.8 billion).

To place these projected changes in income in perspective, the value in 2020-21 of this whole of life impact[57] is equivalent to increasing the average income of all current residents of:

— NSW by between $256 and $518 per person under the modest and ambitious local content scenarios, respectively

— Australia as a whole by between $84 and $149 per person under the modest and ambitious local content scenarios, respectively.

8.4 Increasing local content will increase employment

The economic modelling projects that the increase in local content associated with the projected new investment will result in a net increase in jobs across Australia. Indeed, over the period 2020-21 to 2040-41 it is projected that between 19,185 and 32,984 employee years[58] of FTE direct and indirect jobs will be created in Australia under the modest and ambitious local content scenarios, respectively. More specifically, over the period 2020-21 to 2040-41 the local content scenarios are projected to increase total employment (by place of residence) in:

— NSW as a whole by between 13,236 and 23,182 employee years under the modest and ambitious local content scenarios, respectively (implying an average annual increase of between 662 and 1,159 FTE jobs)

— Australia as a whole by between 19,185 and 32,984 employee years under the modest and ambitious local content scenarios, respectively (an average annual increase of between 959 and 1,649 FTE jobs).

These impacts may be smaller than expected because, given Australia's strong labour market (characterised by low levels of unemployment and high rates of labour market participation), there is only a small pool of people who are currently not in employment that could be employed directly and indirectly on the projects. The projects and the flow on industries will therefore need to attract workers from other industries with the net result being that the cumulative job impact is not as high as might be expected.

Employment associated with the increased local content is projected to peak:

— in 2031 at around 1,870 FTE jobs in NSW and 780 FTE jobs in the rest of Australia under the modest local content scenario

— in 2027 at around 3,410 FTE jobs in NSW and 1,018 FTE jobs in the rest of Australia under the ambitious local content scenario.

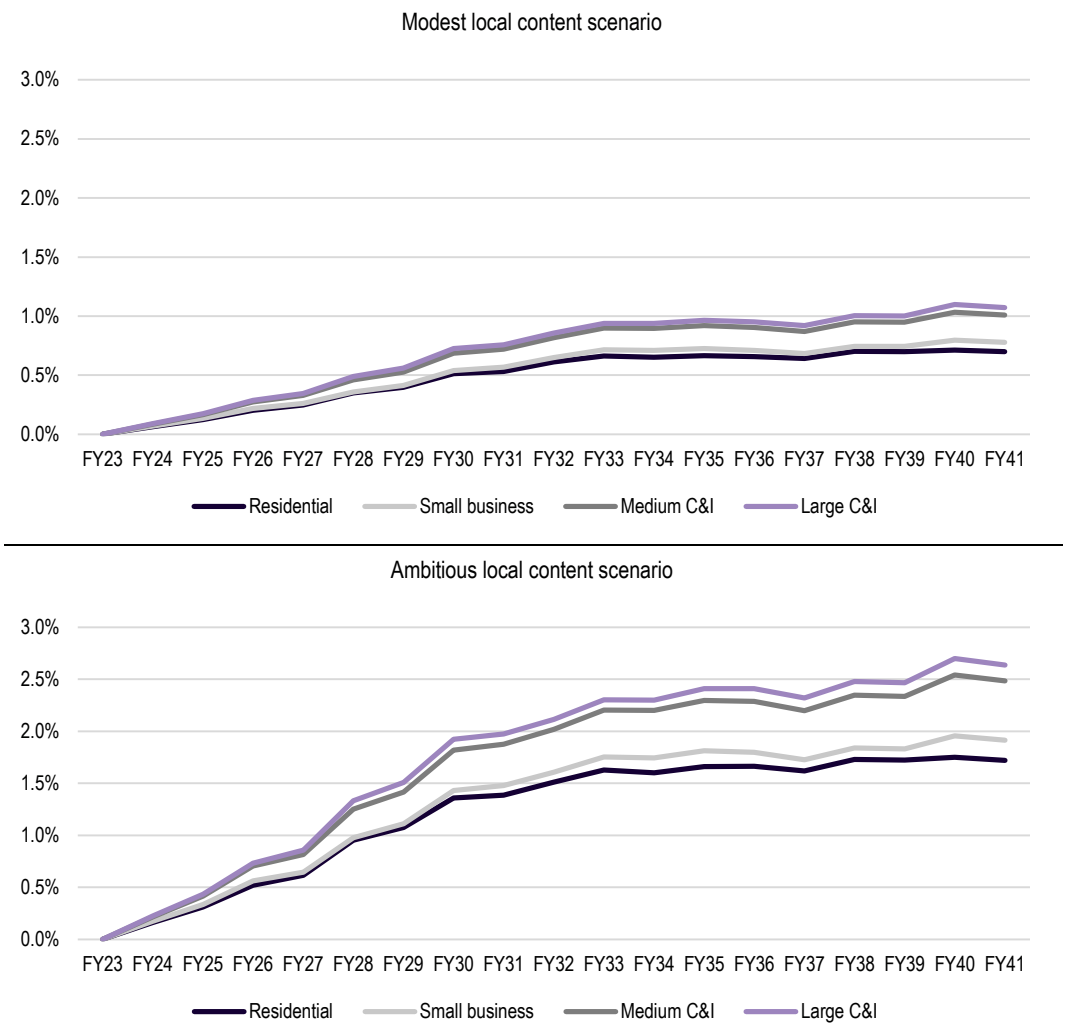
8.5 Customers are willing to pay for increased local content

As illustrated in Figure 8.1, based on the assumptions that have been used in this analysis, the impact of the local content scenarios on retail electricity bills for NSW electricity customers is estimated to be up to 1.1 per cent under the modest local content scenario and 2.7 per cent under the ambitious local content scenario. The increases in the retail electricity bills for residential and small business customers are estimated to be lower than for medium and large C&I customers.

[57] That is, the discounted present values of the projected changes in real income using a 7 per cent real discount rate.

[58] An employee year is employment of one full time equivalent (FTE) person for one year or one 0.5 FTE person for two years.

Figure 8.1 Impact of local content scenarios on retail electricity bills, NSW weighted average

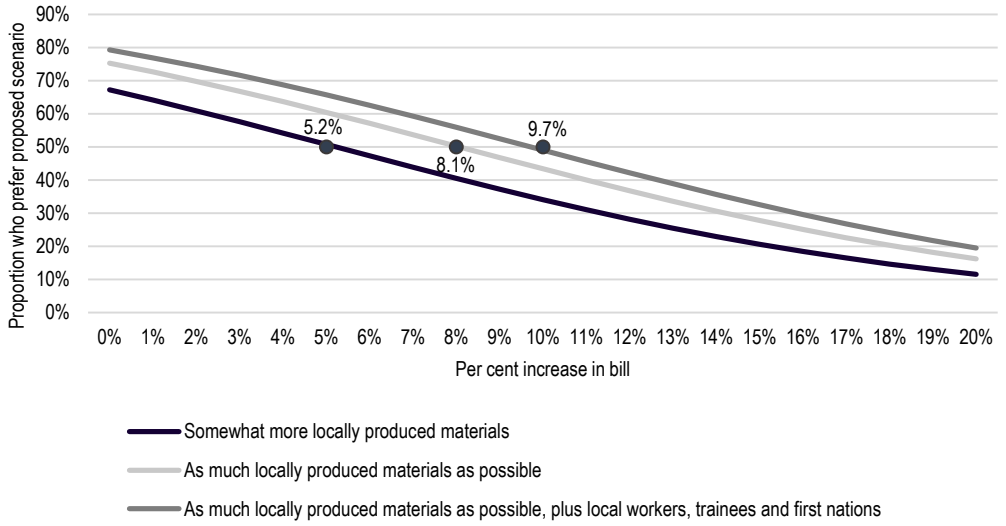


Source: ACIL Allen

The estimated increases in retail electricity bills for increased local content are lower than the amount that survey participants indicated they are willing to pay for increased local content.

Figure 8.2 illustrates that survey participants indicated they are willing to pay, on average, 5.2 per cent more for somewhat more locally produced materials, 8.1 per cent more for as much locally produced materials as possible, and 9.7 per cent more for as much locally produced materials as possible as well as more local workers, contribution by apprentices and trainees, and participation by First Nations people. Survey participants indicated that they are not willing to pay for increased participation by First Nations people.

Figure 8.2 Willingness to pay for increased local content



Source: ACIL Allen

8.6 Practical implications

One of the most significant challenges to increase local content is to address a "chicken and egg" situation.

New facilities will not be established unless there is sufficient certainty of a sustainable market over the longer term, with the legislation in and of itself not considered by stakeholders consulted to provide sufficient certainty to invest, as it does not mandate a minimum level of local content. Rather, it provides discretion to the Consumer Trustee to balance the objectives in the Act and associated Regulations.

There are previous examples of the boom and bust cycle where facilities have been established locally to meet an increase in demand but shut down when demand declined. To avoid a boom and bust cycle, it is recommended that governments at the Commonwealth and State level coordinate energy policies that bring forward new generation capacity and network augmentation. By doing so, any new facilities established in New South Wales could supply projects in other states, thus achieving continuity of operation over time, augmenting the benefits identified in this report.

Additionally, local manufacturers need to have an established track record before engineering, procurement and construction (EPC) contractors are prepared to include their product in a tender for a project. For example, one EPC requires local manufacturers to be certified before proposing them as a subcontractor in any tender. To be certified, the local manufacturer needs to demonstrate that the delivery timeline risk is manageable and the project will be bankable for the EPC contractor. Factors that influence the delivery timeline risk and bankability of the project include:

— capacity – ability to meet the throughput required
— quality
— ability to support operation and maintenance in the long term
— ability to provide performance guarantees
— ability to meet design requirements, noting that the design requirements will differ by original equipment manufacturer (OEM)

— ability to meet AEMO's technical requirements, noting that only a small number of manufacturers are currently able to meet these for some components

— demonstrated experience.

Once a final investment decision has been made to invest in new local facilities, stakeholders consulted estimated it would take 12-18 months to establish local manufacturing facilities in a pre-existing factory.

As a consequence, there is a significant lag from the time that a clear signal to invest in local facilities is provided to the inclusion of locally manufactured products in projects.[59]

8.7 Recommendations for assessing the actual costs and benefits

Economic modelling has been undertaken on an ex ante basis for this project to estimate the economic benefits associated with potential local content requirements, with the costs estimated using a range of assumptions.

The actual costs and benefits of potential local content requirements during the development phase could similarly be estimated by using actual data provided by parties that enter into a LTESA and then conducting economic modelling on an ex post basis at the completion of the development phase.[60] The economic modelling would assess the difference between:

— a base case, which provides the counterfactual in the absence of additional local content requirements

— an actual case, which is based on the actual expenditure and employment during the development phase.

The ex post economic modelling would need to consider the projects supported through LTESAs as well as any new or expanded local assembly or manufacturing.

8.7.1 Projects supported through LTESAs

To enable the ex post economic modelling to be undertaken, the bidders would need to submit two offers:

1. one that would be made in the absence of any local content requirements
2. one that meets (or exceeds) the local content requirements.

The submission of an offer that would be made in the absence of any local requirements would provide the costs associated with the counterfactual or base case scenario for the purposes of the ex post economic modelling.

To enable the ex post economic modelling to be undertaken, the LTESA offers would need to provide, for each offer, a breakdown of the estimated expenditure, in similar categories to those that have been considered for the modelling and analysis for this report.

Successful parties that enter into a LTESA would then need to report the actual data. The actual data could be provided on a periodic basis (for example, 3, 6 or 12 monthly) or at the completion of the development phase. If the data is provided on a periodic basis, the Department would be able

[59] The lag period will vary by technology, but includes the time to provide a clear investment signal, the time for investors to commit to investing in new local facilities, the time to establish new local facilities, the time to pre-qualify with EPCs, the time for the EPC to tender for a project and then the delivery of the locally manufactured products and projects.

[60] Similar modelling could also be done after the tender stage based on the tendered costs and could also consider the costs and benefits associated with the operational and maintenance phase.

to monitor the likelihood that the local requirements, as tendered, will be met. It is recommended that the LTESA contract include an obligation to report this data.

The data that would be required to undertake ex post economic modelling is set out in Table 8.3. This data would be required at the tender stage and at the completion of the development phase.

Table 8.3 Data requirements to assess the costs and benefits of the potential local content requirements on an ex post basis, projects

Data	
Construction phase expenditure (excluding construction employment payments)	For each item of expenditure, by year and by source (NSW, other Australia, New Zealand or other overseas) For each major item of expenditure sourced from Australia or New Zealand: – description of item – name of supplier – whether item would have been sourced from that supplier in absence of local content requirements
Construction phase employment (number of full time equivalent employees)	By year and by employment source (NSW, other Australia, New Zealand or other overseas)
Construction employment payments	By year and including: – wages and salaries – superannuation – workers compensation – leave loading – allowances
Profile of skills / occupations employed in the construction phase	By year and by source (NSW, other Australia, New Zealand or other overseas)
Revenue (if any)	By year
Taxes paid in Australia	By year, by local/state/Commonwealth taxes and including: – council rates – payroll taxes – corporate income taxes – etc.
Foreign exchange assumptions	Exchange rate on imported items
Ownership arrangements	Proportion of ownership held domestically versus overseas

Source: ACIL Allen

8.7.2 New or expanded local assembly or manufacturing

To assess the economic benefits associated with local content requirements, data is also required on new or expanded local assembly or manufacturing to support each project. It is recommended that the Department consider how an obligation can be placed on local assembly or manufacturing facilities to provide the data that would be required – whether this can be through the LTESAs or whether a separate agreement would need to be entered into.

The data required would vary depending on whether a new facility is established that is dedicated to supplying components for successful LTESA proponents, or whether an existing facility is expanded or a new facility established to service a broader market.

The data that would be required for each project to undertake ex post economic modelling to assess the costs and benefits of new or expanded local assembly or manufacturing facilities is set out in Table 8.4.

Table 8.4 Data requirements to assess the costs and benefits of the potential local content requirements on an ex post basis, local manufacturing or assembly facilities

Data	
Was the facility established or expanded to provide local content for the project?	If so, by year and by source (NSW, other Australia, New Zealand or other overseas): – expenditure to establish or expand facility (excluding employment payments) – construction phase employment (number of full time equivalent employees) – employment payments
Does the facility supply only NSW-based projects?	If no, proportion of facility's output that supplies NSW-based projects, by year
Assembly or manufacturing expenditure (excluding employment payments) for project X	For each item of expenditure, by year and by source (NSW, other Australia, New Zealand or other overseas)
Assembly or manufacturing employment (number of full time equivalent employees)	By year and by employment source (NSW, other Australia, New Zealand or other overseas) To be provided either for: – project X, if this is separately identifiable, or – the facility, with an estimated proportion of the employment payments incurred for project X
Assembly or manufacturing employment payments	By year and including: – wages and salaries – superannuation – workers compensation – leave loading – allowances To be provided either for: – project X, if this is separately identifiable, or – the facility, with an estimated proportion of the employment payments incurred for project X
Profile of skills / occupations employed in assembly or manufacturing	By year and by source (NSW, other Australia, New Zealand or other overseas), either: – profile of skills / occupations for project X, if this is separately identifiable, or – profile of skills / occupations for the facility
Revenue	By year for project X and as a percentage of revenue for the facility
Taxes paid in Australia	By year for the facility, by local/state/Commonwealth taxes and including: – council rates – payroll taxes – corporate income taxes – etc.
Foreign exchange assumptions	Exchange rate on imported items

Data	
Ownership arrangements	Proportion of ownership held domestically versus overseas
Did the facility continue operating following project X?	If so: – Costs and revenue associated with local markets, by year – Costs and revenue associated with export markets, by year

Source: ACIL Allen

Additional scenario following consultation

9

Following consultation with the Renewable Energy Sector Board and its members on the modest and ambitious local content scenarios, an additional scenario was modelled – this is referred to as the minimum requirements local content scenario.[61] The minimum requirements local content scenario is similar to the modest local content scenario, with changes to a number of the assumptions, as described in section 9.1. These differences take into consideration the lag time to establish the new facilities required to increase the local content (as discussed in sections 2.4.1 and 2.4.2).

As new facilities are established over time, the modest local content scenario would become achievable. Given the lag time for new facilities, this would be in at least two years' time.

The inputs to the economic modelling of the minimum requirements local content scenario, including the projected changes to the retail electricity bills, are provided in section 9.2, and the results from the economic modelling are provided in section 9.3.

9.1 Assumptions used in the minimum requirements local content scenario

The assumptions used in the modelling of the minimum requirements local content scenario were the same as those used in the modest local content scenario except for the changes that are listed in Table 9.1. As for the modest local content scenario, we took into account the capacity of SMEs in Australia and New Zealand to deliver the materials required when making these assumptions for the minimum requirements local content scenario.

Table 9.1 Changes to assumptions for the minimum requirements local content scenario

Component	Modest local content scenario	Minimum requirements local content scenario
All	Increase in local labour costs of 2%	Increase in local labour costs of 3%
Wind		
Tower	Local (50% materials : 50% labour) with a 30% cost premium	Local assembly with 50% labour and 50% materials, of which 10% of the materials are local. A 30% cost premium applies to all local labour and materials

[61] This scenario aligns with the minimum requirements in the Renewable Energy Sector Board's Plan.

Component	Modest local content scenario	Minimum requirements local content scenario
Pumped hydro storage		
Pipework – intakes and waterways (including gates & valves)	30% of cost of pipework is local steel	30% of steel for pipework is local, 70% of steel is imported
Operating and maintenance	80% of labour local and 20% imported	55% of labour local and 45% imported
Transmission lines		
Tower	Local	Imported

Source: ACIL Allen based on changes to assumptions as advised

The change in assumption for the transmission lines flows through to the connection assets for each generation technology.

9.2 Inputs to the economic modelling

This section compares the inputs to the economic modelling under the minimum requirements local content scenario to the inputs for the modest local content scenario.

9.2.1 Construction or development phase

Table 9.2 compares the investment at the development phase between the modest local content scenario and the minimum requirements local content scenario. The investment is slightly lower under the minimum requirements local content scenario compared to the modest local content scenario.

Table 9.2 Investment, development phase (in 2021 dollars)

	Undiscounted investment	Discounted investment
Modest local content scenario	$45.1 billion	$40.2 billion
Minimum requirements local content scenario	$44.6 billion	$39.8 billion
Increase relative to base case		
Modest local content scenario	$1.9 billion	$1.6 billion
Minimum requirements local content scenario	$1.4 billion	$1.2 billion

Note: Investment discounted to 2021 using the discount rates in Table 2.9

Source: ACIL Allen analysis

Table 9.3 compares the estimated local content at the development phase under the modest local content scenario with the estimated local content under the minimum requirements local content scenario. The local content is slightly lower under the minimum requirements local content scenario than under the modest local content scenario for large scale PV, pumped hydro and battery storage. For these technologies, the increase in local content with the increase in the cost of local labour is offset by the reduction in local content for transmission towers (used in the connection assets) and a reduction in local steel for the pipework for pumped hydro storage.

There is a more substantial reduction in the local content for wind and network augmentation with the reduction in the use of local steel.

Table 9.3 Estimated local content under each scenario, by technology, development phase

Technology	Modest local content scenario	Minimum requirements local content scenario
Generation, storage and firming technologies (including connection assets)		
Wind	51%	40%
Large scale solar PV	50%	49%
Pumped hydro (8 hours)	68%	66%
Battery storage	23%	23%
Network augmentation		
Transmission	77%	68%

Note: Local materials, labour and indirect costs as a proportion of total costs

Source: ACIL Allen assumptions

Steel requirements in the development phase

Table 9.4 compares the steel requirements during the development phase for the modest and minimum requirements local content scenarios. For the purposes of this table, the proportion of steel that is local relates to the generation technology only, excluding the connection assets. There is a lower proportion of local steel in the minimum requirements local content scenario than in the modest local content scenario.

Table 9.4 Estimated proportion of steel that is local under each scenario, by technology, development phase

Technology	Modest local content scenario	Minimum requirements local content scenario
Generation, storage and firming technologies (excluding connection assets)		
Wind	100%	10%
Large scale solar PV	100%	100%
Pumped hydro (8 hours)	100%	30%
Battery storage	100%	100%
Network augmentation		
Transmission	100%	11%

Note: Local materials, labour and indirect costs as a proportion of total costs

Source: ACIL Allen assumptions

9.2.2 Operating and maintenance phase

Table 9.5 compares the investment at the operating and maintenance phase between the modest local content scenario and the minimum requirements local content scenario. The investment is slightly higher under the minimum requirements local content scenario compared to the modest local content scenario with the assumed increase in local labour rates.

Table 9.5 Investment, operating and maintenance phase (in 2021 dollars)

	Undiscounted investment	Discounted investment
Modest local content scenario	$19.3 billion	$12.9 billion
Minimum requirements local content scenario	$19.4 billion	$13.0 billion

	Undiscounted investment	Discounted investment
Increase relative to base case		
Modest local content scenario	$0.3 billion	$0.2 billion
Minimum requirements local content scenario	$0.4 billion	$0.3 billion

Note: Investment discounted to 2021 using the discount rates in Table 2.9

Source: ACIL Allen analysis

Table 9.6 compares the estimated local content at the operating and maintenance phase under the modest local content scenario with the estimated local content under the minimum requirements local content scenario. The changes in local content vary by technology depending on the relative proportions of materials and labour, as well as the changes that have been made to the assumptions.

The most substantial reductions in local content are for wind, with the reduction in local steel, and for pumped hydro storage with the reduction in local steel and more reliance on imported labour.

Table 9.6 Estimated local content under each scenario, by technology, operating and maintenance phase

Technology	Modest local content scenario	Minimum requirements local content scenario
Generation, storage and firming technologies (including connection assets)		
Wind	59%	51%
Large scale solar PV	71%	71%
Pumped hydro (8 hours)	75%	61%
Battery storage	34%	35%
Network augmentation		
Transmission	77%	78%

Note: Local materials, labour and indirect costs as a proportion of total costs

Source: ACIL Allen assumptions

9.2.3 Impact on retail electricity bills

Table 9.7 compares the average estimated increases in retail electricity bills over the period from FY 24 to FY 41 under the modest and minimum requirements local content scenarios. The lower level of investment under the minimum requirements local content scenario compared to the modest local content scenario results in a lower average estimated increase in retail electricity bills.

Table 9.7 Average estimated increase in retail electricity bills, FY24 to FY41

Type of customer	Modest local content scenario	Minimum requirements local content scenario
Residential	0.5%	0.3%
Small business	0.5%	0.3%
Medium C&I	0.7%	0.4%
Large C&I	0.7%	0.4%
Weighted average	0.6%	0.4%

Type of customer	Modest local content scenario	Minimum requirements local content scenario

Source: ACIL Allen

9.3 Results from the economic modelling

This section compares the broader economic impacts under the minimum requirements local content scenario to the impacts under the modest local content scenario – the gross economic contribution (from the IO modelling) is compared in section 9.3.1 and the net economic contribution (from the CGE modelling) is compared in section 9.3.2.

9.3.1 Gross economic contribution

This section compares the estimated value added and employment contributions from the investment under the minimum requirements local content scenario to the estimated contribution for the modest local content scenario.

Value added contribution

Table 9.8 compares the estimated value added contributions to the NSW and Australian economies during the construction phase, in net present value terms, between the modest local content scenario and the minimum requirements local content scenario over the period 2020-21 to 2040-41.

The estimated value added contribution is lower under the minimum requirements local content scenario than the modest local content scenario. In particular, it is estimated that the increased local content during the construction phase would contribute $4.3 billion in net present terms to the NSW economy under the minimum requirements local content scenario (compared to a contribution of $5.8 billion under the modest local content scenario). The lower value added contribution of the minimum requirements local content scenario compared to the modest local content scenario is driven by the lower local content under the minimum requirements local content scenario.

It is estimated that the minimum requirements local content scenario would contribute $6.5 billion to the overall Australian GDP (including the contribution to the NSW economy) (compared to a contribution of $9.1 billion under the modest local content scenario).

As noted before, these estimates represent an upper limit on the potential impact on the NSW and Australian economy associated with increased local content during the construction phase of the projects.

Table 9.8 Estimated value added contribution from increased local content during the construction phase (relative to the base case, FY2021 AUD$m), NPV7

	Direct contribution	Indirect contribution		Total contribution
		Production induced	Consumption induced	
Modest local content scenario				
NSW (GSP)	51	3,376	2,389	5,816
Rest of Australia	463	1,686	1,174	3,323
Australia (GDP)	514	5,062	3,563	9,139
Minimum requirements local content scenario				
NSW (GSP)	88	2,365	1,866	4,319
Rest of Australia	152	998	1,018	2,168
Australia (GDP)	240	3,363	2,884	6,487

Note: Estimates for Australia include NSW and rest of Australia. Totals may not add due to rounding.

Source: ACIL Allen estimates.

Employment contribution

Table 9.9 compares the estimated employment contributions to NSW and Australia during the construction phase between the modest local content scenario and the minimum requirements local content scenario. As shown in this table, it is estimated the total employment contribution to NSW associated with the increased local content under the minimum requirements local content scenario would be significantly lower than under the modest local content scenario. In particular, it is estimated that the minimum requirements local content scenario:

— would support a total of 33,633 additional FTE jobs in NSW (compared to 51,586 under the modest local content scenario) and 16,325 FTE jobs across the rest of Australia (compared to 19,341 under the modest local content scenario) over the period 2020-21 to 2040-41

— would generate, on average, 1,529 FTE jobs in NSW per year (compared to 2,345 under the modest local content scenario) and 742 FTE jobs across the rest of Australia (compared to 879 under the modest local content scenario).

Table 9.9 Estimated employment contribution from increased local content scenarios during the construction phase (relative to the base case, FTE jobs), FY2021 to FY2041

	Direct contribution	Indirect contribution		Total contribution	Annual average
		Production induced	Consumption induced		
Modest local content scenario					
NSW	-	27,450	24,135	51,586	2,345
Rest of Australia	-	7,258	12,083	19,341	879
Australia	-	34,708	36,218	70,926	3,224
Minimum requirements local content scenario					
NSW	-	14,538	19,095	33,633	1,529
Rest of Australia	-	5,784	10,540	16,325	742
Australia	-	20,322	29,635	49,957	2,271

	Direct contribution	Indirect contribution		Total contribution	Annual average
		Production induced	Consumption induced		

Note: FTE= Full time equivalent.

Source: ACIL Allen estimates.

9.3.2 Net economic impact

This section compares the net economic impact of the minimum requirements local content scenario to the estimated net economic impact for the modest local content scenario. As mentioned in Chapter 4, these net economic impacts include both the investment effect during the construction phase (where local economic activity increases as a result of the projects) and the price effect during the operational phase (where the costs of the local content scenarios will be passed through to consumers in the form of increased energy prices).

Real economic output

Table 9.10 compares the projected changes in real economic output (GSP and GDP) between the modest local content scenario and the minimum requirements local content scenario over the period 2020-21 to 2040-41. As shown in this table, the estimated changes in real economic output in NSW (GSP) and Australia overall (GDP) in net present value terms are slightly lower under the minimum requirements local content scenario compared to the modest local content scenario.

In particular, it is estimated that the minimum requirements local content scenario:

— would increase NSW's GSP by $520 million using a 7 per cent discount rate. This compares to an increase in GSP of $544 million under the modest local content scenario

— would increase Australia's GDP by $178 million using a 7 per cent discount rate. This compares to an increase in GDP by $200 million under the modest local content scenario.[62]

Table 9.10 Projected change in real economic output from increased local content (FY2021 to FY2041), relative to the base case (FY2021 AUD$m)

	Modest local content scenario				Minimum requirements local content scenario			
	Total	NPV3	NPV7	NPV10	Total	NPV3	NPV7	NPV10
New South Wales	683	626	544	486	738	634	520	452
Rest of Australia	-717	-513	-344	-263	-707	-508	-343	-263
Total Australia	-34	113	200	222	31	126	178	189

Source: ACIL Allen modelling.

Real income

The projected changes in real income under the modest local content scenario and the minimum requirements local content scenario are presented in Table 9.11. As shown in this table, the estimated changes in real income in NSW and Australia overall are slightly lower under the minimum requirements local content scenario compared to the modest local content scenario.

In particular, over the period 2020-21 to 2040-41, the minimum requirements local content scenario is projected to (relative to the base case):

[62] As noted earlier in the report, this 'discrepancy' between a decrease in GDP in cumulative terms but an increase in GDP in present value terms is explained by the timing of the positive and negative impacts of the scenario, with the increases in GDP happening earlier in the period of analysis and the decreases happening later in the period, which results in a net increase in GDP in present value terms.

— increase the real income of NSW by a cumulative total of $2.6 billion. The present value of this change is equivalent to a one-off increase in real income of $1.9 billion

— reduce the real income of other states and territories (rest of Australia) as a result of the pull of activity towards NSW. While the rest of Australia will benefit somewhat from the price effect through terms of trade gains, these are not enough to offset the reductions in demand due to the local content effect

— increase the real income of Australia as a whole by $2.5 billion (with a net present value of between $2.0 billion).

To place these projected changes in income in perspective, the value in 2020-21 of this whole of life impact[63] is equivalent to increasing the average income of all current residents of:

— NSW by $238 per person

— Australia as a whole by $79 per person.

Table 9.11 Projected change in real income under different local content scenarios (FY2021 to FY2041), relative to the base case (FY2021 AUD $m)

	Modest local content scenario				Minimum requirements local content scenario			
	Total	NPV3	NPV7	NPV10	Total	NPV3	NPV7	NPV10
New South Wales	2,608	2,399	2,094	1,877	2,580	2,295	1,949	1,724
Rest of Australia	-97	-7	53	72	-85	10	70	90
Total Australia	2,510	2,392	2,146	1,950	2,495	2,305	2,019	1,813

Source: ACIL Allen modelling.

Employment creation

Table 9.12 compares the impacts on employment creation between the modest local content scenario and the minimum requirements local content scenario. The number of additional jobs created is slightly higher under the minimum requirements local content scenario compared to the modest local content scenario. This is because, despite the slightly lower local content under the minimum requirements local content scenario compared to the modest local content scenario, the increase in labour costs related to this local content is higher under the minimum requirements local content scenario than under the modest local content scenario and hence the real wage rate drives slightly higher additional labour supply.

Over the period 2020-21 to 2040-41 the minimum requirements local content scenario is projected to increase total employment[64] (by place of residence) in:

— NSW as a whole by 13,382 employee years (implying an average annual increase of 669 FTE jobs). This compares to 13,236 employee years (or 662 FTE jobs per year) under the modest local content scenario

— Australia as a whole (including NSW) by 19,215 employee years (an average annual increase of 961 FTE jobs). This compares to 19,185 employee years (or 959 FTE jobs per year) under the modest local content scenario.

[63] That is, the discounted present values of the projected changes in real income using a 7 per cent real discount rate.

[64] Including direct and indirect jobs.

Table 9.12 Projected impacts of the increase in local content associated with the projected new investment on the labour market, relative to the base case

	Employee years from FY2021 to FY2041	Average employee years from FY2021 to FY2041
Modest local content scenario		
NSW	13,236	662
Rest of Australia	5,949	297
Australia	19,185	959
Minimum requirements local content scenario		
NSW	13,382	669
Rest of Australia	5,833	292
Australia	19,215	961

Source: ACIL Allen modelling.

Wages

Table 9.13 shows the projected changes in real wages in NSW and Australia under the minimum requirements local content scenario and the modest local content scenario. As shown in this table, the increase in average real wages in both NSW and Australia overall as a result of the minimum requirements local content scenario is marginally higher than under the modest local content scenario.

Table 9.13 Projected changes in real wages over the period 2020-21 to 2040-41, relative to the base case, per cent

	Modest local content scenario	Minimum requirements local content scenario
NSW	0.054	0.055
Rest of Australia	0.025	0.025

Note: Real wages refer to wages adjusted for the effect of prices (inflation).

Source: ACIL Allen modelling.

Foreign trade

Table 9.14 compares the projected change in real net foreign trade (goods and services) under the modest local content scenario and the minimum requirements local content scenario. As shown in this table, it is projected that, compared to the modest local content scenario, the minimum requirements local content scenarios will drive:

— A smaller decrease in real imports. As shown in Table 9.14, over the period 2020-21 to 2040-41 the minimum requirements local content scenario is projected to decrease real imports of Australia by a cumulative total of $764 million. The present value of these changes is equivalent to a one-off decrease in real imports of $235 million.

— A smaller decrease in real exports. Over the period 2020-21 to 2040-41 the minimum requirements local content scenario is projected to decrease real exports of Australia by a cumulative total of $7.6 billion (with a present value of $4.6 billion).

In net terms, under the minimum requirements local content scenario, Australia is projected to have a smaller trade deficit than under the modest local content scenario.

Table 9.14 Projected change in real exports and imports as a result of the local content scenarios, relative to the base case (FY2021 AUD$m)

	Modest local content scenario			Minimum requirements local content scenario				
	Total	Total	Total	Total	Total	NPV3	NPV7	NPV10
Real exports	-9,297	-7,393	-5,632	-4,692	-7,639	-6,071	-4,622	-3,849
Real imports	-1,902	-1,355	-903	-687	-764	-464	-235	-136
Net real foreign trade [a]	-7,395	-6,038	-4,729	-4,005	-6,875	-5,607	-4,387	-3,713

[a] Foreign trade is calculated as exports minus imports.

Source: ACIL Allen modelling.

Government revenues

Table 9.15 provides a comparison of the anticipated total additional tax revenues projected to be generated as a result of the minimum requirements local content scenario and the modest local content scenario. As shown in this table:

- the NSW Government's revenue is projected to be largely the same under the minimum requirements local content scenario and the modest local scenario
- the Australian Government is projected to benefit from slightly higher revenue under the minimum requirements local content scenario than under the modest local content scenario.

In particular, it is estimated that over the period 2020-21 to 2040-41 under the minimum requirements local content scenario:

- The NSW government would benefit from $267 million in additional tax revenue. This includes:
  - additional payroll taxes of $183 million
  - indirect taxes (including a proportion of GST collected by the Commonwealth which will be distributed back to NSW[65]) of $84 million.
- The Australian Government would increase its tax revenues by $1,160 million.
- Tax revenues for other states and territories are projected to decrease as a result of the reallocation of economic activity discussed in previous sections.

Table 9.15 Cumulative projected change in real government tax revenues, relative to the base case (FY2021 AUD$m)

	Total (FY2021 to FY2041)	Net present value		
		3%	7%	10%
Modest local content scenario				
NSW payroll tax	180	149	118	101
NSW originated GST	86	79	69	62
Total NSW	**265**	**228**	**187**	**162**
Other Commonwealth Government income taxes	982	842	691	600
Other State and Federal Government taxes	-226	-171	-123	-99
Total Australia	**1,021**	**898**	**754**	**663**

[65] Distribution of Commonwealth GST between states is not hypothecated back to states based on their contribution of gross revenue, but rather is distributed based on a complex formula calculated by the Commonwealth Grants Commission taking into account revenue-raising capacity, 'disabilities' and expenditure needs.

	Total (FY2021 to FY2041)	Net present value		
		3%	7%	10%
Minimum requirements local content scenario				
NSW payroll tax	183	149	117	99
NSW originated GST	84	75	64	56
Total NSW	**267**	**224**	**181**	**156**
Other Commonwealth Government income taxes	1,048	876	702	602
Other State and Federal Government taxes	-155	-116	-83	-66
Total Australia	**1,160**	**984**	**800**	**692**

Note: GST revenues generated within the NSW economy may not all be transferred back to NSW. Similarly, a portion of Australian Government tax revenues may actually be transferred to NSW (either directly or indirectly). Tax revenues do not include taxes on the transfer of property.

Source: ACIL Allen modelling.

Industry results

Table 9.16 compares the effects of the minimum requirements local content scenario and the modest local content scenario on the real output of different industry sectors. As shown in this table, the biggest gains in NSW under the minimum requirements local content scenario are concentrated in the same industries as under the modest local content scenario — in the manufacturing sectors.

The pattern of economic activity is similar under both the minimum requirements local content scenario and the modest local content scenario, except for the construction sector and transport services.

— Under the modest local content scenario, the effect of reallocation of activity due to increased demand for labour in manufacturing sectors and the price effect (increased wages and energy costs in NSW) more than offsets the direct increase in demand for these services as a result of the increased local content, resulting in a decrease in construction services in NSW and an increase in construction services from the rest of Australia (some of the services previously bought from NSW are now being bought from other states as a result of the increased costs of these services in NSW).

— Under the minimum requirements local content scenario, the increased demand for labour is lower than under the modest local content scenario, resulting in a smaller reallocation of activity and so this effect is not enough to offset the direct increase in demand from the increased local content leading to a small increase in output in construction services in NSW.

Table 9.16 Cumulative projected change in real output by industry, relative to the base case (FY2021 AUD$m)

Industry	Modest local content scenario		Minimum requirements local content scenario	
	Total (FY2021 to FY2041)	NPV7	Total (FY2021 to FY2041)	NPV7
NSW				
Agriculture	-589	-370	-147	-93
Mining	-776	-452	-159	-87
Iron and steel	2,259	1,432	2,248	1,414
Other manufacturing	17	131	1,138	781
Electricity and water	-1,079	-586	-312	-158
Transport services	-1,095	-666	24	19

Industry	Modest local content scenario		Minimum requirements local content scenario	
	Total (FY2021 to FY2041)	NPV7	Total (FY2021 to FY2041)	NPV7
Construction services	-1,177	-718	148	88
Retail and wholesale trade	28	61	-15	4
Government services	555	368	-3	2
Other services	-1,001	-627	-234	-159
Rest of Australia				
Agriculture	-492	-308	-49	-32
Mining	-1,413	-871	96	60
Iron and steel	-257	-161	-6	-5
Other manufacturing	-3,086	-1,971	-366	-243
Electricity and water	-99	-63	78	47
Transport services	-523	-320	-27	-18
Construction services	1,141	726	115	81
Retail and wholesale trade	-118	-61	-19	-13
Government services	336	223	-9	-7
Other services	-305	-117	31	31
Total Australia				
Agriculture	-1,081	-678	-197	-125
Mining	-2,189	-1,323	-63	-27
Iron and steel	2,002	1,271	2,241	1,409
Other manufacturing	-3,069	-1,840	772	538
Electricity and water	-1,178	-649	-234	-110
Transport services	-1,618	-986	-3	1
Construction services	-35	9	263	169
Retail and wholesale trade	-90	-0	-35	-9
Government services	891	591	-12	-5
Other services	-1,306	-744	-202	-128

Source: ACIL Allen modelling.

Labour market sensitivity

This section analyses the sensitivity of the modelled impacts under the minimum requirements local content scenario and the modest local content scenario of fully constraining the labour market where the supply of labour nationally is unchanged with and without the local content policy, compared to the standard labour market assumptions in the CGE model.

The results are presented in Table 9.17. As shown in this table, under both the modest local content scenario and the minimum requirements local content scenario:

— the projected GDP benefits become negative if the labour market is fully constrained

— the projected real income benefits remain positive if the labour market is fully constrained, but smaller than when using the standard Tasman Global labour market assumptions.

Table 9.17 Labour market sensitivity – projected change in Australian real GDP and real income under different local content scenarios and labour market assumptions (FY2021 to FY2041), relative to the base case (FY2021 AUD$m)

	Modest local content scenario				Minimum requirements local content scenario			
	Standard Tasman Global (TG) labour market		Full constrained labour supply		Standard TG labour market		Full constrained labour supply	
	Total	NPV7	Total	NPV7	Total	NPV7	Total	NPV7
Real GDP	–34	200	–2,766	–1,550	31	178	-2,709	-1,552
Real income	2,510	2,146	–167	442	2,495	2,019	-198	330

Source: ACIL Allen modelling.

Appendices

Projected new electricity infrastructure

A

The network augmentation projects that have been assumed to accommodate the new renewable generation and storage capacity are set out in Table 2.1.

The composition of each of the new network augmentation projects was estimated based on information provided by the Department and published in AEMO's ISP, by seeking to reconcile the total project costs to the unit costs published by AEMO (refer Table A.1). There is a variance between the total project cost as provided by the Department and the cost build up based on the composition of the projects, but these variances are not considered to be material.

Table A.1 Composition of the projected new network augmentation projects

Project	Item of plant	Quantity	Cost
Central-West Orana REZ	500 kV single circuit line	160 km	$341 million
	500 / 330 kV 1,500 MVA transformer	2	$45 million
	3CB diameter 2 CBs – 500 kV	12	$109 million
	3CB diameter 2 CBs – 330 kV	4	$24 million
	20,000 m^2 substations	3	$74 million
	Total		**$592 million**
SW NSW stability improvement Option 1A	330 kV single circuit line	90 km	$144 million
	3CB diameter 2 CBs – 330 kV	2	$12 million
	Total		**$156 million**
New England REZ	500 kV double circuit line	270 km	$689 million
	500 kV single circuit line	200 km	$427 million
	500 / 330 kV 1,500 MVA transformer	2	$45 million
	500 / 330 kV 500 MVA transformer	1	$20 million
	3CB diameter 2 CBs – 500 kV	11	$75 million
	3CB diameter 2 CBs – 330 kV	5	$30 million
	20,000 m^2 substations	2	$48 million
	Total		**$1,335 million**
QNI medium- west of the path (southern portions only)	500 kV single circuit line	180 km	$384 million
	3CB diameter 2 CBs – 500 kV	2	$18 million
	20,000 m^2 substations	1	$24 million
	Total		**$426 million**

Project	Item of plant	Quantity	Cost
Sydney Ring 500 kV North and South paths	500 kV double circuit line	250 km	$638 million
	330 kV single circuit line	25 km	$40 million
	500 / 330 kV 1,500 MVA transformer	2	$45 million
	500 / 330 kV 500 MVA transformer	1	$23 million
	3CB diameter 2 CBs – 500 kV	9	$82 million
	3CB diameter 2 CBs – 330 kV	13	$78 million
	30,000 m^2 substations	1	$33 million
	Total		**$938 million**

Source: ACIL Allen estimates based on information provided by the Department and AEMO's ISP

Cost assumptions for each of the local content scenarios

B

Table B.1 sets out the assumptions that have been made on the capital cost of generators and transmission network augmentations under each of the local content scenarios.

The cells in the table have been highlighted in purple where local assembly or local manufacture is assumed in the modest and/or ambitious local content scenario where it was not assumed in the base case.

Table B.1 Cost assumptions for each of the local content scenarios

Component	% of cost (base in 2021)	Base case	Modest local content scenario	Ambitious local content scenario
Wind farm				
Materials				
Rotor	18%	Imported	Local assembly with 80% imported material, and balance local costs (10% local materials and 90% local labour) with a 30% cost premium	Local manufacture with 40% of materials imported, 30% local materials and 30% local labour with a 30% cost premium on local components
Nacelle	32%			
Tower	11%	Imported	Local (50% materials : 50% labour) with a 30% cost premium	Local (50% materials : 50% labour) with a 30% cost premium
Other (cabling, safety and security, monitoring and control	4%	Local	As per base	As per base
Delivery				
Turbine	4%		80% of base case cost	50% of base case cost
Tower	1%		Nil	Nil
Installation				
Mechanical	9%	80% local labour, 20% imported labour	Increase local cost by 2%	Increase local cost by 5%
Electrical	6%	80% local labour, 20% imported labour	Increase local cost by 2%	Increase local cost by 5%
Inspection	1%	Local labour	Increase local cost by 2%	Increase local cost by 5%
Indirect	15%	50% local labour, 50% imported labour	As per base	As per base
Solar farm				
Materials				
Modules	30%	Imported	As per base	Local manufacture with 50% local materials and 50% local labour with a 50% cost premium on local components
Inverters	8%	Imported	As per base	As per base
Racking and mounting	12%	Assume 40% of materials cost is imported steel	Local	Local

Component	% of cost (base in 2021)	Base case	Modest local content scenario	Ambitious local content scenario
Other (cabling, safety and security, monitoring and control)	7.5%	Local	As per base	As per base
Delivery				
Modules	2%		As per base	Nil
Inverter	0.3%		As per base	As per base
Installation				
Mechanical	13%	80% local labour, 20% imported labour	Increase local cost by 2%	Increase local cost by 5%
Electrical	7%	80% local labour, 20% imported labour	Increase local cost by 2%	Increase local cost by 5%
Inspection	1%	Local labour	Increase local cost by 2%	Increase local cost by 5%
Indirect	19%	50% local labour, 50% imported labour	As per base	As per base
Pumped hydro storage				
Materials				
Pump / turbine	7%	Imported	As per base	Local manufacture with 70% local materials and 30% local labour with a 40% cost premium on local components
Generator	7%	Imported	As per base	As per base
Monitoring and controls	2%	Imported	As per base	As per base
Civil work				
Upper reservoir	11%	Local – 80% labour, 20% concrete	Increase local labour cost by 2%	Increase local labour cost by 5%
Lower reservoir	11%			
Power station	6%			
Access tunnels and construction	5%			
Access road to site	4%			
Pipework				
Intakes	3%	Local – 50% labour, 20% concrete Imported – 30% steel	Local steel, increase local labour cost by 2%	Local steel, increase local labour cost by 5%
Waterways (including gates & valves)	8%			

Component	% of cost (base in 2021)	Base case	Modest local content scenario	Ambitious local content scenario
Labour – power station	7%	80% local labour, 20% imported labour	Increase local cost by 2%	Increase local cost by 5%
Other – environmental offsets	2%	Local – 90% labour, 10% materials	Increase local labour cost by 2%	Increase local labour cost by 5%
Indirect	28%	50% local, 50% imported	As per base	As per base
Battery storage				
Materials				
300 MW / 450 MWh lithium ion batteries	60%	Imported	As per base	70% local manufacture with 80% local materials and 20% local labour with a 30% cost premium, and 30% imported materials
Cable (DC & AC)	14%	Imported	As per base	70% local manufacture with 80% local materials and 20% local labour with a 30% cost premium, and 30% imported materials
Installation				
Civil and structural works	10%	Local – 50% labour, 20% concrete, 30% steel	Local steel, increase local labour cost by 2%	Local steel, increase local labour cost by 5%
Electrical works	6%	75% local labour, 25% imported labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Secondary systems	1%	75% local labour, 25% imported labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Design and survey	3%	Local labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Testing and commissioning	1%	75% local labour, 25% imported labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Indirect				
Project management and overheads	5%	Local (50% local labour, 25% local indirect and 25% imported indirect)	Increase local labour cost by 2%	Increase local labour cost by 5%
Transmission lines				
Materials				
Tower	12%	Imported	Local	Local
Conductor	18%	Imported	As per base	Local manufacture (80% materials : 20% labour) with 20% cost increase
Installation				
Civil and structural	22%	Local – 80% labour, 20% concrete	Increase local labour cost by 2%	Increase local labour cost by 5%

Component	% of cost (base in 2021)	Base case	Modest local content scenario	Ambitious local content scenario
Electrical	27%	Local labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Design and survey	4%	Local labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Testing and commissioning	1%	Local labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Indirect				
Project management and overheads	6%	Local (50% labour, 50% indirect)	Increase local labour cost by 2%	Increase local labour cost by 5%
Easement / property costs	2%	Local – 10% labour, 90% materials	Increase local labour cost by 2%	Increase local labour cost by 5%
Environmental offsets	10%	Local – 90% labour, 10% materials	Increase local labour cost by 2%	Increase local labour cost by 5%
Transformers				
Materials				
Transformer & associated equipment	62%	Imported	As per base	1,500 MVA – as per base 500 MVA – local manufacture (70% materials, 30% labour with 30% cost increase)
HV cables	11%	Imported	As per base	Local manufacture (80% materials : 20% labour) with 20% cost increase
Installation				
Civil and structural	11%	Local – 80% labour, 20% concrete	Increase local labour cost by 2%	Increase local labour cost by 5%
Electrical	7%	75% local labour, 25% imported labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Secondary systems	1%	75% local labour, 25% imported labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Design and survey	3%	Local labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Testing and commissioning	1%	50% local labour, 50% imported labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Indirect				
Project management and overheads	5%	25% local labour, 75% imported indirect	Increase local labour cost by 2%	Increase local labour cost by 5%
Circuit breakers				
Materials				
Circuit breaker & associated equipment	23%	Imported	As per base	As per base

Component	% of cost (base in 2021)	Base case	Modest local content scenario	Ambitious local content scenario
HV cables	13%	Imported	As per base	Local manufacture (80% materials : 20% labour) with 20% cost increase
Installation				
Civil and structural	31%	Local – 80% labour, 20% concrete	Increase local labour cost by 2%	Increase local labour cost by 5%
Electrical	9%	75% local labour, 25% imported labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Secondary systems	5%	75% local labour, 25% imported labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Design and survey	8%	Local labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Testing and commissioning	1%	50% local labour, 50% imported labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Indirect				
Project management and overheads	10%	25% local labour, 75% imported indirect	Increase local labour cost by 2%	Increase local labour cost by 5%
Substations				
Materials				
HV installations (inc. cables)	1%	Imported	As per base	Local assembly (50% imported, 50% local (80% materials : 20% labour) with 20% cost increase)
Fire protection equipment	0.6%	Local	As per base	As per base
Communication system equipment	0.4%	Local	As per base	As per base
Installation				
Civil and structural	70%	Local – 50% labour, 20% concrete, 30% imported steel	Local steel, increase local labour cost by 2%	Local steel, increase local labour cost by 5%
Electrical	5%	75% local labour, 25% imported labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Fire protection	4%	Local labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Communication systems	7%	Local labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Design and survey	2%	Local labour	Increase local labour cost by 2%	Increase local labour cost by 5%
Testing and commissioning	2%	75% local labour, 25% imported labour	Increase local labour cost by 2%	Increase local labour cost by 5%

Component	% of cost (base in 2021)	Base case	Modest local content scenario	Ambitious local content scenario
Indirect				
Project management and overheads	7%	Local (50% labour, 50% indirect)	Increase local labour cost by 2%	Increase local labour cost by 5%
Easement / property costs	1%	Local – 10% labour, 90% materials	Increase local labour cost by 2%	Increase local labour cost by 5%
Environmental offsets	0.4%	Local – 90% labour, 10% materials	Increase local labour cost by 2%	Increase local labour cost by 5%
Connection assets				
330 kV single circuit line	29%		As per transmission lines	
New substation establishment	15%		As per substations	
Transformer	17%		As per 500 MVA transformer	
Switchbay	10%		As per circuit breakers	
Indirect	29%	25% local labour, 25% local indirect, 50% imported indirect	Increase local labour cost by 2%	Increase local labour cost by 5%

Source: ACIL Allen assumptions

C Input-Output analysis

C.1 Overview

Input-output tables provide a snapshot of an economy at a particular time. Input-output tables can be used to derive input-output multipliers. These multipliers show how changes to a given part of an economy impact on the economy as a whole. A full set of input-output multipliers for each region would be estimated for the purpose of this analysis.

The input-output multipliers allow analysis of the economic footprint of a particular facility, industry or event for the region of interest. The input-output multipliers allow rigorous and credible economic impact analysis to be performed for the region of interest. Input-output multipliers are suitable tools for analysing the impact of the following types of economic change:

- companies' expenditure
- construction projects
- changes in exports
- changes in private or government consumption
- sporting or cultural events
- changes in visitor expenditure.

The common factor in each of these cases is that local production is stimulated as a result of an increase in final demand for the region's goods and services. Final demand includes private consumption, government consumption, investment and exports (including sales to tourists/visitors). Increases in final demand provide a stimulus to the economy of a region that filters through the entire economy due to the linkages between local industries. Input-output multipliers capture these linkages and this is what makes them such a useful tool for economic impact analysis.

C.2 Multiplier types

Input-output multipliers estimate the economic impact on a region's economy from a one dollar change in the final demand for the output of one of the region's industries. Generally, four types of multipliers are used:

- Output – measures the impact on the output of all industries in the economy
- Income – measures the effect on the wages and salaries paid to workers within the economy
- Employment – measures the jobs creation impact, and
- Value-added – measures the impact on wages and salaries, profits and indirect taxes.

The sum of wages and salaries, profits and indirect taxes for a given industry provides a measure of its contribution to the size of the local economy – its contribution to gross state or regional

product (GSP/GRP). The value added multiplier can therefore also be considered to be the GSP/GRP multiplier.

Input-output multipliers are a flexible tool for economic analysis. Their flexibility stems from the different forms of each multiplier type. For this project, for each region, multipliers would be estimated in the following forms:

— initial effects
— first round effects
— industrial support effects
— production induced effects
— consumption induced effects
— simple multipliers
— total multipliers
— type 1A multipliers
— type 1B multipliers
— type 2A multipliers. and
— type 2B multipliers.

The above multiplier types are defined in full in Johnson (2004)[66] for output, income, employment and value-added multipliers; however, a brief overview of the different types of output multipliers is presented below.

C.2.1 Multiplier effects

When additional sales to final demand are made, for example through increased exports or sales to the public, production increases to meet the increased demand, and this is the initial effect. Since production increases to exactly match the increased final demand, the increase is always equal to one (noting that the multipliers are defined in terms of a one dollar increase in final demand).

The industry producing the additional output makes purchases to enable itself to increase production, these new purchases are met by production increases in other industries and these constitute the first round effect. These first round production increases cause other industries to also increase their purchases, and these purchases cause other industries to increase their production, and so on. These 'flow-on' effects eventually diminish, but when 'added together constitute the industrial support effect.

The industrial support effect added to the first round effect is known as the production induced effect. So far this chain of events has ignored one important factor, the effect on labour and its consumption. When output increases, employment increases, and increased employment translates to increased earnings and consumption by workers, and this translates to increased output to meet the increased consumption. This is the consumption effect.

C.2.2 Multipliers

The simple and total multipliers are derived by summing the effects. The simple multiplier is the sum of the initial and production induced effects. The total multiplier is larger, because it also adds in the consumption effect. All the effects and multipliers listed have had one thing in common, they all measure the impact on the economy of the initial increase in final demand.

[66] Johnson, Peter (ACIL Allen) (2004), *An Input-Output Table for the Gascoyne Region of Western Australia*. Gascoyne Development Commission.

The remaining multipliers take a different point of view, they are ratios of the above multiplier types to the initial effect. The type 1A multiplier is calculated as the ratio of the initial and first round effects to the initial effect, while the type 1B multiplier is the ratio of the simple multiplier to the initial effect. The type 2A multiplier is the ratio of the total multiplier to the initial effect, while the type 2B multiplier is the ratio of the total multiplier less the initial effect to the initial effect.

Given the large number of multiplier types to choose from, output, income, employment and value-added multipliers, and each with numerous variations (simple, total, type 2A, etc.) it is important that the analysis uses the most appropriate multipliers. Usually, the multipliers that include consumption effects (i.e. the added impact that comes from wage and salaries earners spending their income) are used. These are the total and type 2A multipliers. The total and type 2A multipliers will generally provide the biggest projected impact. Simple or type 1B (which omit the consumption effect) may be used to provide a more conservative result.

C.3 Limitations of I-O analysis

Although input-output analysis is valid for understanding the contribution a project makes to the economy, is not without its limitations. Input-output tables are a snapshot of an economy in a given period, the multipliers derived from these tables are therefore based on the structure of the economy at that time, a structure that it is assumed remains fixed over time. When multipliers are applied, the following is assumed:

— prices remain constant

— technology is fixed in all industries, and

— import shares are fixed.

Therefore, the changes predicted by input-output multipliers proceed along a path consistent with the structure of the economy described by the input-output table. This precludes economies of scale. That is, no efficiency is gained by industries getting larger – rather they continue to consume resources (including labour and capital) at the rate described by the input-output table. Thus, if output doubles, the use of all inputs doubles as well.

One other assumption underpinning input-output analysis which is worth considering is that there are assumed to be unlimited supplies of all resources, including labour and capital. With input-output analysis, resource constraints are not a factor. It is thus assumed that no matter how large a development, all required resources are available, and that there is no competition between industries for these resources.

It is important to understand the limitations of input-output analysis, and to remember that the analysis provides an estimate of economic contribution of a project or industry, not a measurement of economic impact if the project or industry shut down or did not exist.

Tasman Global Model

D

Tasman Global is a dynamic, global CGE model that has been developed by ACIL Allen for the purpose of undertaking economic impact analysis at the regional, state, national and global level.

A CGE model captures the interlinkages between the markets of all commodities and factors, taking into account resource constraints, to find a simultaneous equilibrium in all markets. A global CGE model extends this interdependence of the markets across world regions and finds simultaneous equilibrium globally. A dynamic model adds onto this the interconnection of equilibrium economies across time periods. For example, investments made today are going to determine the capital stocks of tomorrow and hence future equilibrium outcomes depend on today's equilibrium outcome, and so on.

A dynamic global CGE model, such as *Tasman Global*, has the capability of addressing total, sectoral, spatial and temporal efficiency of resource allocation as it connects markets globally and over time. Being a recursively dynamic model, however, its ability to address temporal issues is limited. In particular, *Tasman Global* cannot typically address issues requiring partial or perfect foresight. However, as documented in Jakeman et al (2001), it is possible to introduce partial or perfect foresight in certain markets using algorithmic approaches. Notwithstanding this, the model does have the capability to project the economic impacts over time of given changes in policies, tastes and technologies in any region of the world economy on all sectors and agents of all regions of the world economy.

Tasman Global was developed from the 2001 version of the Global Trade and Environment Model (GTEM) developed by ABARE (Pant 2001) and has been evolving ever since. In turn, GTEM was developed out of the MEGABARE model (ABARE 1996), which contained significant advancements over the Global Trade Analysis Project (GTAP) model of that time (Hertel 1997).

D.1 A dynamic model

Tasman Global is a model that estimates relationships between variables at different points in time. This is in contrast to comparative static models, which compare two equilibriums (one before an economic disturbance and one following). A dynamic model such as *Tasman Global* is beneficial when analysing issues for which both the timing of and the adjustment path that economies follow are relevant in the analysis.

D.2 The database

A key advantage of *Tasman Global* is the level of detail in the database underpinning the model. The database is derived from the GTAP database (Aguiar et al. 2019). This database is a fully documented, publicly available global data base which contains complete bilateral trade information, transport and protection linkages among regions for all GTAP commodities. It is the most detailed database of its type in the world.

Tasman Global builds on the GTAP database by adding the following important features:

- a detailed population and labour market database
- detailed technology representation within key industries (such as electricity generation and iron and steel production)
- disaggregation of a range of major commodities including iron ore, bauxite, alumina, primary aluminium, brown coal, black coal and LNG
- the ability to repatriate labour and capital income
- explicit representation of the states and territories of Australia
- the capacity to represent multiple regions within states and territories of Australia explicitly.

Nominally, version 10.1 of the *Tasman Global* database divides the world economy into 153 regions (145 international regions plus the 8 states and territories of Australia) although in reality the regions are frequently disaggregated further. ACIL Allen regularly models Australian or international projects or policies at the regional level including at the or at the state/territory/provincial level for various countries.

The *Tasman Global* database also contains a wealth of sectoral detail currently identifying up to 76 industries (Table D.1). The foundation of this information is the input-output tables that underpin the database. The input-output tables account for the distribution of industry production to satisfy industry and final demands.

Industry demands, so-called intermediate usage, are the demands from each industry for inputs. For example, electricity is an input into the production of communications. In other words, the communications industry uses electricity as an intermediate input.

Final demands are those made by households, governments, investors and foreigners (export demand). These final demands, as the name suggests, represent the demand for finished goods and services. To continue the example, electricity is used by households – their consumption of electricity is a final demand.

Each sector in the economy is typically assumed to produce one commodity, although in *Tasman Global*, the electricity, transport and iron and steel sectors are modelled using a 'technology bundle' approach. With this approach, different known production methods are used to generate a homogeneous output for the 'technology bundle' industry. For example, electricity can be generated using brown coal, black coal, petroleum, base load gas, peak load gas, nuclear, hydro, geothermal, biomass, wind, solar or other renewable based technologies – each of which has its own cost structure.

The other key feature of the database is that the cost structure of each industry is also represented in detail. Each industry purchases intermediate inputs (from domestic and imported sources) primary factors (labour, capital, land and natural resources) as well as paying taxes or receiving subsidies.

Table D.1 Standard sectors in the *Tasman Global* CGE model

no	Name	no	Name
1	Paddy rice	39	Diesel (incl. nonconventional diesel)
2	Wheat	40	Other petroleum, coal products
3	Cereal grains nec	41	Chemical, rubber, plastic products
4	Vegetables, fruit, nuts	42	Iron ore
5	Oil seeds	43	Bauxite
6	Sugar cane, sugar beet	44	Mineral products nec
7	Plant- based fibres	45	Ferrous metals
8	Crops nec	46	Alumina
9	Bovine cattle, sheep, goats, horses	47	Primary aluminium
10	Pigs	48	Metals nec
11	Animal products nec	49	Metal products
12	Raw milk	50	Motor vehicle and parts
13	Wool, silk worm cocoons	51	Transport equipment nec
14	Forestry	52	Electronic equipment
15	Fishing	53	Machinery and equipment nec
16	Brown coal	54	Manufactures nec
17	Black coal	55	Electricity generation
18	Oil	56	Electricity transmission and distribution
19	LNG	57	Gas manufacture, distribution
20	Other natural gas	58	Water
21	Minerals nec	59	Construction
22	Bovine meat products	60	Trade
23	Pig meat products	61	Road transport
24	Meat products nec	62	Rail and pipeline transport
25	Vegetables oils and fats	63	Water transport
26	Dairy products	64	Air transport
27	Processed rice	65	Transport nec
28	Sugar	66	Warehousing and support activities
29	Food products nec	67	
30	Wine	68	Communication
31	Beer	69	Financial services nec
32	Spirits and RTDs	70	Insurance
33	Other beverages and tobacco products	71	Business services nec
34	Textiles	72	Recreational and other services
35	Wearing apparel	73	Public Administration and Defence
36	Leather products	74	Education
37	Wood products	75	Human health and social work activities
38	Paper products, publishing	76	Dwellings

Note: nec = not elsewhere classified.

Source: ACIL Allen

D.3 Model structure

Given its heritage, the structure of the *Tasman Global* model closely follows that of the GTAP and GTEM models and interested readers are encouraged to refer to the documentation of these models for more detail (namely Hertel 1997 and Pant 2001, respectively). In summary:

— The model divides the world into a variety of regions and international waters.

- Each region is fully represented with its own 'bottom-up' social accounting matrix and could be a local community, an LGA, state, country or a group of countries. The number of regions in a given simulation depends on the database aggregation. Each region consists of households, a government with a tax system, production sectors, investors, traders and finance brokers.
- 'International waters' are a hypothetical region in which global traders operate and use international shipping services to ship goods from one region to the other. It also houses an international finance 'clearing house' that pools global savings and allocates the fund to investors located in every region.
- Each region has a 'regional household'[67] that collects all factor payments, taxes, net foreign borrowings, net repatriation of factor incomes due to foreign ownership and any net income from trading of emission permits.

— The income of the regional household is allocated across private consumption, government consumption and savings according to a Cobb-Douglas utility function, which, in practice, means that the share of income going to each component is assumed to remain constant in nominal terms.

— Private consumption of each commodity is determined by maximising utility subject to a Constant Difference of Elasticities (CDE) function which includes both price and income elasticities.

— Government consumption of each commodity is determined by maximising utility subject to a Cobb-Douglas utility function.

— Each region has *n* production sectors, each producing single products using various production functions where they aim to maximise profits (or minimise costs) and take all prices as given. The nature of the production functions chosen in the model means that producers exhibit constant returns to scale.

- In general, each producer supplies consumption goods by combining an aggregate energy-primary factor bundle with other intermediate inputs and according to a Leontief production function (which in practice means that the quantity shares remain in fixed proportions). Within the aggregate energy-primary factor bundle, the individual energy commodities and primary factors are combined using a nested Constant Elasticity of Substitution (CES) production function, in which energy and primary factor aggregates substitute according to a CES function with the individual energy commodities and individual primary factors substituting with their respective aggregates according to further CES production functions.
- Exceptions to the above include the electricity generation, iron and steel and road transport sectors. These sectors employ the 'technology bundle' approach developed by ABARE (1996) in which non-homogenous technologies are employed to produce a homogenous output with the choice of technology governed by minimising costs according to a modified Constant Ratios of Elasticities of Substitution, Homothetic (CRESH) production function. For example, electricity may be generated from a variety of technologies (including brown coal, black coal, gas, nuclear, hydro, solar etc.), iron and steel may be produced from blast furnace or electric arc technologies while road transport services may be supplied using a range of different vehicle technologies. The 'modified-CRESH' function differs from the traditional CRESH function by also imposing the condition that the quantity units are homogenous.

— There are four primary factors (land, labour, mobile capital and fixed capital). While labour and mobile capital are used by all production sectors, land is only used by agricultural sectors while fixed capital is typically employed in industries with natural resources (such as fishing, forestry and mining) or in selected industries built by ACIL Allen.

[67] The term "regional household" was devised for the GTAP model. In essence it is an agent that aggregates all incomes attributable to the residents of a given region before distributing the funds to the various types of regional consumption (including savings).

- Land supply in each region is typically assumed to remain fixed through time with the allocation of land between sectors occurring to maximise returns subject to a Constant Elasticity of Transformation (CET) utility function.
- Mobile capital accumulates as a result of net investment. It is implicitly assumed in *Tasman Global* that it takes one year for capital to be installed. Hence, supply of capital in the current period depends on the last year's capital stock and investments made during the previous year.
- Labour supply in each year is determined by endogenous changes in population, given participation rates and a given unemployment rate. In policy scenarios, the supply of labour is positively influenced by movements in the real wage rate governed by the elasticity of supply. For countries where sub-regions have been specified (such as Australia), migration between regions is induced by changes in relative real wages with the constraint that net interregional migration equals zero. For regions where the labour market has been disaggregated to include occupations, there is limited substitution allowed between occupations by individuals supplying labour (according to a CET utility function) and by firms demanding labour (according to a CES production function) based on movements in relative real wages.
- The supply of fixed capital is given for each sector in each region.

The model has the option for these assumptions to be changed at the time of model application if alternative factor supply behaviours are considered more relevant.

- It is assumed that labour (by occupation) and mobile capital are fully mobile across production sectors implying that, in equilibrium, wage rates (by occupation) and rental rates on capital are equalised across all sectors within each region. To a lesser extent, labour and capital are mobile between regions through international financial investment and migration, but this sort of mobility is sluggish and does not equalise rates of return across regions.
- For most international regions, for each consumer (private, government, industries and the local investment sector), consumption goods can be sourced either from domestic or imported sources. In any country that has disaggregated regions (such as Australia), consumption goods can also be sourced from other intrastate or interstate regions. In all cases, the source of non-domestically produced consumption goods is determined by minimising costs subject to a CRESH utility function. Like most other CGE models, a CES demand function is used to model the relative demand for domestically-produced commodities versus non-domestically produced commodities. The elasticities chosen for the CES and CRESH demand functions mean that consumers in each region have a higher preference for domestically-produced commodities than non-domestic commodities and a higher preference for intrastate- or interstate-produced commodities than foreign commodities.
- The capital account in *Tasman Global* is open. Domestic savers in each region purchase 'bonds' in the global financial market through local 'brokers' while investors in each region sell bonds to the global financial market to raise investible funds. A flexible global interest rate clears the global financial market.
- It is assumed that regions may differ in their risk characteristics and policy configurations. As a result, rates of return on money invested in physical capital may differ between regions and therefore may be different from the global cost of funds. Any difference between the local rates of return on capital and the global cost of borrowing is treated as the result of the existence of a risk premium and policy imperfections in the international capital market. It is maintained that the equilibrium allocation of investment requires the equalisation of changes in (as opposed to the absolute levels of) rates of return over the base year rates of return.
- Any excess of investment over domestic savings in a given region causes an increase in the net debt of that region. It is assumed that debtors service the debt at the interest rate that clears the global financial market. Similarly, regions that are net savers gives rise to interest receipts from the global financial market at the same interest rate.

- Investment in each region is used by the regional investor to purchase a suite of intermediate goods according to a Leontief production function to construct capital stock with the regional investor cost minimising by choosing between domestic, interstate and imported sources of each intermediate good via the CRESH production function. The regional cost of creating new capital stock versus the local rates of return on mobile capital is what determines the regional rate of return on new investment.
- In equilibrium, exports of a good from one region to the rest of world are equal to the import demand for that good in the remaining regions. Together with the merchandise trade balance, the net payments on foreign debt add up to the current account balance. *Tasman Global* does not require that the current account be in balance every year. It allows the capital account to move in a compensatory direction to maintain the balance of payments. The exchange rate provides the flexibility to keep the balance of payments in balance.
- Detailed bilateral transport margins for every commodity are specified in the starting database. By default, the bilateral transport mode shares are assumed to be constant, with the supply of international transportation services by each region solved by a cost-minimising international trader according to a Cobb-Douglas demand function.
- Emissions of six anthropogenic greenhouse gases (namely, carbon dioxide, methane, nitrous oxide, HFCs, PFCs and SF_6) associated with economic activity are tracked in the model. Almost all sources and sectors are represented; emissions from agricultural residues and land-use change and forestry activities are not explicitly modelled but can be accounted for externally. Prices can be applied to emissions which are converted to industry-specific production taxes or commodity-specific sales taxes that impact on demand. Abatement technologies similar to those adopted in a report released by the Commonwealth Government (2008) are available and emission quotas can be set globally or by region along with allocation schemes that enable emissions to be traded between regions.

More detail regarding specific elements of the model structure are discussed in the following sections.

D.4 Population growth and labour supply

Population growth is an important determinant of economic growth through the supply of labour and the demand for final goods and services. Population growth for each region represented in the *Tasman Global* database is projected using ACIL Allen's in-house demographic model. The demographic model projects how the population in each region grows and how age and gender composition changes over time and is an important tool for determining the changes in regional labour supply and total population over the projected period.

For each of region, the model projects the changes in age-specific birth, mortality and net migration rates by gender for 101 age cohorts (0-99 and 100+). The demographic model also projects changes in participation rates by gender by age for each region, and, when combined with the age and gender composition of the population, endogenously projects the future supply of labour in each region. Changes in life expectancy are a function of income per person as well as assumed technical progress on lowering mortality rates for a given income (for example, reducing malaria-related mortality through better medicines, education, governance etc.). Participation rates are a function of life expectancy as well as expected changes in higher education rates, fertility rates and changes in the work force as a share of the total population.

Labour supply is derived from the combination of the projected regional population by age by gender and regional participation rates by age by gender. Over the projected period labour supply in most developed economies is projected to grow slower than total population because of ageing population effects.

For the Australian states and territories, the projected aggregate labour supply from ACIL Allen's demographic module is used as the base level potential workforce for the detailed Australian labour market module, which is described in the next section.

D.5 The Australian labour market

Tasman Global has a detailed representation of the Australian labour market which has been designed to capture:

- different occupations
- changes to participation rates (or average hours worked) due to changes in real wages
- changes to unemployment rates due to changes in labour demand
- limited substitution between occupations by the firms demanding labour and by the individuals supplying labour, and
- limited labour mobility between states and regions within each state.

Tasman Global recognises 97 different occupations within Australia – although the exact number of occupations depends on the aggregation. The firms that hire labour are provided with some limited scope to change between these 97 labour types as the relative real wage between them changes. Similarly, the individuals supplying labour have a limited ability to change occupations in response to the changing relative real wage between occupations. Finally, as the real wage for a given occupation rises in one state relative to other states, workers are given some ability to respond by shifting their location. The model produces results at the 97 3-digit Australian New Zealand Standard Classification of Occupations (ANZSCO) level which are presented in Table D.2.

The labour market structure of *Tasman Global* is thus designed to capture the reality of labour markets in Australia, where supply and demand at the occupational level do adjust, but within limits.

Labour supply in *Tasman Global* is presented as a three-stage process:

1. labour makes itself available to the workforce based on movements in the real wage and the unemployment rate;
2. labour chooses between occupations in a state based on relative real wages within the state; and
3. labour of a given occupation chooses in which state to locate based on movements in the relative real wage for that occupation between states.

By default, *Tasman Global*, like all CGE models, assumes that markets clear. Therefore, overall, supply and demand for different occupations will equate (as is the case in other markets in the model).

Table D.2 Occupations in the *Tasman Global* database, ANZSCO 3-digit level (minor groups)

ANZSCO code, Description	ANZSCO code, Description	ANZSCO code, Description
1. MANAGERS	**3. TECHNICIANS & TRADES WORKERS**	**5. CLERICAL & ADMINISTRATIVE**
111 Chief Executives, General Managers and Legislators	311 Agricultural, Medical and Science Technicians	511 Contract, Program and Project Administrators
121 Farmers and Farm Managers	312 Building and Engineering Technicians	512 Office and Practice Managers
131 Advertising and Sales Managers	313 ICT and Telecommunications Technicians	521 Personal Assistants and Secretaries
132 Business Administration Managers	321 Automotive Electricians and Mechanics	531 General Clerks
133 Construction, Distribution and Production Managers	322 Fabrication Engineering Trades Workers	532 Keyboard Operators
134 Education, Health and Welfare Services Managers	323 Mechanical Engineering Trades Workers	541 Call or Contact Centre Information Clerks
135 ICT Managers	324 Panel beaters, and Vehicle Body Builders, Trimmers and Painters	542 Receptionists
139 Miscellaneous Specialist Managers	331 Bricklayers, and Carpenters and Joiners	551 Accounting Clerks and Bookkeepers
141 Accommodation and Hospitality Managers	332 Floor Finishers and Painting Trades Workers	552 Financial and Insurance Clerks
142 Retail Managers	333 Glaziers, Plasterers and Tilers	561 Clerical and Office Support Workers
149 Miscellaneous Hospitality, Retail and Service Managers	334 Plumbers	591 Logistics Clerks
	341 Electricians	599 Miscellaneous Clerical and Administrative Workers
2. PROFESSIONALS	342 Electronics and Telecommunications Trades Workers	**6. SALES WORKERS**
211 Arts Professionals	351 Food Trades Workers	611 Insurance Agents and Sales Representatives
212 Media Professionals	361 Animal Attendants and Trainers, and Shearers	612 Real Estate Sales Agents
221 Accountants, Auditors and Company Secretaries	362 Horticultural Trades Workers	621 Sales Assistants and Salespersons
222 Financial Brokers and Dealers, and Investment Advisers	391 Hairdressers	631 Checkout Operators and Office Cashiers
223 Human Resource and Training Professionals	392 Printing Trades Workers	639 Miscellaneous Sales Support Workers
224 Information and Organisation Professionals	393 Textile, Clothing and Footwear Trades Workers	
225 Sales, Marketing and Public Relations Professionals	394 Wood Trades Workers	**7. MACHINERY OPERATORS & DRIVERS**
231 Air and Marine Transport Professionals	399 Miscellaneous Technicians and Trades Workers	711 Machine Operators
232 Architects, Designers, Planners and Surveyors		712 Stationary Plant Operators
233 Engineering Professionals	**4. COMMUNITY & PERSONAL SERVICE**	721 Mobile Plant Operators
234 Natural and Physical Science Professionals	411 Health and Welfare Support Workers	731 Automobile, Bus and Rail Drivers
241 School Teachers	421 Child Carers	732 Delivery Drivers
242 Tertiary Education Teachers	422 Education Aides	733 Truck Drivers
249 Miscellaneous Education Professionals	423 Personal Carers and Assistants	741 Storepersons
251 Health Diagnostic and Promotion Professionals	431 Hospitality Workers	
252 Health Therapy Professionals	441 Defence Force Members, Fire Fighters and Police	**8. LABOURERS**
253 Medical Practitioners	442 Prison and Security Officers	811 Cleaners and Laundry Workers
254 Midwifery and Nursing Professionals	451 Personal Service and Travel Workers	821 Construction and Mining Labourers
261 Business and Systems Analysts, and Programmers	452 Sports and Fitness Workers	831 Food Process Workers
262 Database and Systems Administrators, and ICT Security Specialists		832 Packers and Product Assemblers
263 ICT Network and Support Professionals		839 Miscellaneous Factory Process Workers
271 Legal Professionals		841 Farm, Forestry and Garden Workers
272 Social and Welfare Professionals		851 Food Preparation Assistants
		891 Freight Handlers and Shelf Fillers
		899 Miscellaneous Labourers

Source: ABS (2009), ANZSCO – Australian and New Zealand Standard Classifications Of Occupations, First edition, Revision 1, ABS catalogue no. 1220.0.

The *Tasman Global* database includes a detailed representation of the Australian labour market that has been designed to capture the supply and demand for different skills and occupations by industry. To achieve this, the Australian workforce is characterised by detailed supply and demand matrices.

On the supply side, the Australian population is characterised by a five-dimensional matrix consisting of:

- 7 post-school qualification levels
- 12 main qualification fields of highest educational attainment
- 97 occupations
- 101 age groups (namely 0 to 99 and 100+)
- 2 genders.

The data for this matrix is measured in persons and was sourced from the ABS 2011 Census. As the skills elements of the database and model structure have not been used for this project, it will be ignored in this discussion.

The 97 occupations are those specified at the 3-digit level (or Minor Groups) under the ANZSCO (see Table D.2).

On the demand side, each industry demands a particular mix of occupations. This matrix is specified in units of FTE jobs where an FTE employee works an average of 37.5 hours per week. Consistent with the labour supply matrix, the data for FTE jobs by occupation by industry was also sourced from the ABS 2011 Census and updated using the latest labour force statistics.

Matching the demand and supply side matrices means that there is the implicit assumption that the average hours per worker are constant, but it is noted that mathematically changes in participation rates have the same effect as changes in average hours worked.

D.6 Labour Market Model Structure

In the model, the underlying growth of each industry in the Australian economy results in a growth in demand for a particular set of skills and occupations. In contrast, the supply of each set of skills and occupations in a given year is primarily driven by the underlying demographics of the resident population. This creates a market for each skill by occupation that (unless specified otherwise) needs to clear at the start and end of each time period.[68] The labour markets clear by a combination of different prices (i.e. wages) for each labour type and by allowing a range of demand and supply substitution possibilities, including:

- changes in firms' demand for labour driven by changes in the underlying production technology
  - for technology bundle industries (electricity, iron and steel and road transportation) this occurs due to changes between explicitly identified alternative technologies
  - for non-technology bundle industries this includes substitution between factors (such as labour for capital) or energy for factors
- changes to participation rates (or average hours worked) due to changes in real wages
- changes in the occupations of a person due to changes in relative real wages
- substitution between occupations by the firms demanding labour due to changes in the relative costs
- changes to unemployment rates due to changes in labour demand, and
- limited labour mobility between states due to changes in relative real wages.

[68] For example, at the start and end of each week for this analysis. *Tasman Global* can be run with different steps in time, such as quarterly or bi-annually in which case the markets would clear at the start and end of these time points.

All of the labour supply substitution functions are modified-CET functions in which people supply their skills, occupation and rates of participation as a positive function of relative wages. However, unlike a standard CET (or CES) function, the functions are 'modified' to enforce an additional constraint that the number of people is maintained before and after substitution.[69]

Although technically solved simultaneously, the labour market in *Tasman Global* can be thought of as a five-stage process:

- labour makes itself available to the workforce based on movements in the real wage (that is, it actively participates with a certain number of average hours worked per week)
- the age, gender and occupations of the underlying population combined with the participation rate by gender by age implies a given supply of labour (the potentially available workforce)
- a portion of the potentially available workforce is unemployed, implying a given available labour force
- labour chooses to move between occupations based on relative real wages
- industries alter their demands for labour as a whole and for specific occupations based on the relative cost of labour to other inputs and the relative cost of each occupation.

By default, *Tasman Global*, like all CGE models, assumes that markets clear at the start and end of each period. Therefore, overall, supply and demand for different occupations will equate (as is the case in other markets in the model). In principle, (subject to zero starting values) people of any age and gender can move between any of the 97 occupations while industries can produce their output with any mix of occupations. However, in practice the combination of the initial database, the functional forms, low elasticities and moderate changes in relative prices for skills, occupations etc. means that there is only low to moderate change induced by these functions. The changes are sufficient to clear the markets, but not enough to radically change the structure of the workforce in the timeframe of this analysis.

Factor-factor substitution elasticities in non-technology bundle industries are industry specific and are the same as those specified in the GTAP database[70], while the fuel-factor and technology bundle elasticities are the same as those specified in GTEM.[71] The detailed labour market elasticities are ACIL Allen assumptions, previously calibrated in the context of the model framework to replicate the historical change in the observed Australian labour market over a five year period[72]. The unemployment rate function in the policy scenarios is a non-linear function of the change in the labour demand relative to the base case with the elasticity being a function of the unemployment rate (that is, the lower the unemployment rate the lower the elasticity and the higher the unemployment rate the higher the elasticity).

[69] As discussed in Dixon et al (1997), a standard CES/CET function is defined in terms of *effective units*. Quantitatively this means that, when substituting between, say, X_1 and X_2 to form a total quantity X using a CET function a simple summation generally does not actually equal X. Use of these functions is common practice in CGE models when substituting between substantially different units (such as labour versus capital or imported versus domestic services) but was not deemed appropriate when tracking the physical number of people. Such 'modified' functions have long been employed in the technology bundles of *Tasman Global* and GTEM. The Productivity Commission have proposed alternatives to the standard CES to overcome similar and other weaknesses when applied to internationally traded commodities.

[70] Narayanan et al. (2012).

[71] Pant (2007).

[72] This method is a common way of calibrating the economic relationships assumed in CGE models to those observed in the economy. See for example Dixon and Rimmer (2002).

D.7 References

Aguiar, A., Chepeliev, M., Corong, E., McDougall, R., & van der Mensbrugghe, D. (2019). The GTAP Data Base: Version 10. *Journal of Global Economic Analysis, 4(1)*, 1-27. Retrieved from https://www.jgea.org/ojs/index.php/jgea/article/view/77.

Australian Government (2008), *Australia's Low Pollution Future: the economics of climate change mitigation*, Australian Government, Canberra.

Dixon, P.B., Parmenter, B., Sutton, J., & Vincent, D. (1997), *ORANI: A Multisectoral Model of the Australian Economy*, Amsterdam: North Holland.

Dixon, P.B. and Rimmer, M.T. (2002), *Dynamic General Equilibrium Modelling for Forecasting and Policy*. Contributions to Economic Analysis 256, Amsterdam: North Holland.

Hertel, T. (1997), *Global Trade Analysis: modelling and applications*, Cambridge University Press, Cambridge.

Jakeman, G., Heyhoe, E., Pant, H., Woffenden, K. and Fisher, B.S. (2001), *The Kyoto Protocol: economic impacts under the terms of the Bonn agreement*. ABARE paper presented to the International Petroleum Industry Environmental Conservation Association conference, 'Long Term Carbon and Energy Management - Issues and Approaches', Cambridge, Massachusetts, 15-16 October.

Pant, H.M. (2007), *GTEM: Global Trade and Environment Model*, ABARE Technical Report, Canberra, June.

Impact on retail electricity bills

E

The retail electricity bills are estimated using a building block approach comprising:

- energy purchase costs
- network costs
- environmental scheme costs
- retail costs and margin
- costs associated with modernising the NSW electricity system
- incremental costs associated with the local content scenario.

The costs associated with modernising the NSW electricity system and the incremental costs associated with the local content scenario are allocated to the electricity distributors and then to customers within the electricity distribution area based on energy consumption (generation costs) and peak demand (network costs).

The assumptions that have been used to estimate the retail electricity bills are set out in Table E.1.

Table E.1 Assumptions used to estimate retail electricity bills

Parameter	Value	Source
Energy purchase costs		
Wholesale electricity costs		Provided by the Department
Hedging costs	60% of wholesale electricity costs for residential customers, 50% for small business customers and 30% for large business customers	ACIL Allen assumption
Network losses	5.2% for Ausgrid, 6% for Endeavour Energy and 4.5% for Essential Energy	Australian Energy Regulator's (AER's) determination of the 2021-22 Default Market Offer
Ancillary services	$0.30 per MWh, increasing by 2 per cent per annum	ACIL Allen assumption
Market fees (including AEMO prudential costs)	$1.00 per MWh, increasing by 2 per cent per annum	ACIL Allen assumption
Network costs		
Distribution charges	Network tariff code as advised by the DNSPs, as set out in Table E.2	DNSPs' 2021-22 annual pricing proposal, with no real change over time
Transmission charges	Network tariff code as advised by the DNSPs, as set out in Table E.2	DNSPs' 2021-22 annual pricing proposal, increasing by 1 per cent per annum

Parameter	Value	Source
Environmental scheme costs		
Large Renewable Energy Target	Declining from $0.43 per MWh in 2022-23 (converted to 2021 dollars) to zero by 2030	Australian Energy market Commission's (AEMC's) 2020 residential price trends report
Small-scale Renewable Energy Scheme	$0.91 per MWh to 2029-30 (converted to 2021 dollars), then zero	AEMC's 2020 residential price trends report
Climate change fund	Network tariff code as advised by the DNSPs	DNSPs' 2021-22 annual pricing proposal, with no real change over time
Energy savings scheme	$0.20 per MWh from 2022-23, converted to 2021 dollars	AEMC's 2020 residential price trends report
Retail costs and margin		
Retail cost	$130 per annum for residential customers $170 per annum for small business customers $3,875 per customer for medium C&I customers $9,856 per customer for large C&I customers	ACIL Allen based on Queensland Competition Authority, Technical appendices, Regulated retail electricity prices for 2021-22, Regional Queensland, March 2021
Retail margin	5.2%	AEMC's 2020 residential price trends report
Contribution to modernising the NSW electricity system		Provided by the Department
Incremental costs associated with local content scenario		Calculated by ACIL Allen by assuming that: – capital costs are annualised over the life of the equipment and incurred from the year of operation – operating and maintenance costs are incurred annually for the life of the equipment – new facilities costs are annualised over the life of the equipment produced in those facilities

Parameter	Value	Source

Source: ACIL Allen assumptions

The distribution and transmission charges have been calculated based on the network tariff codes as set out in Table E.2.

Table E.2 Network tariff codes, by customer type and electricity distribution area

Customer type	Ausgrid	Endeavour Energy	Essential Energy
Residential	EA116	N70	BLNT3AL
Small business	EA256	N90	BLNN1AU
Medium C&I	EA305	N19	BLND3AO
Large C&I	EA310	N29	BHND3AO

Source: Information provided by the electricity distributors

Some of the distribution and transmission charges are based on the energy consumption during peak, shoulder and off-peak periods. Where this is the case, the splits that have been used are set out in Table E.3.

Table E.3 Energy consumption, by peak, shoulder and off-peak periods

	Peak	Shoulder	Off-peak
Ausgrid			
Small business	15.6%	41.9%	42.5%
Medium C&I	15.2%	39.8%	45.0%
Large C&I	14.4%	37.7%	47.9%
Endeavour Energy			
Medium C&I	6.0%	7.7%	86.3%
Large C&I	5.1%	7.4%	87.6%
Essential Energy			
Residential	15.7%	32.0%	52.4%
Medium C&I	10.1%	41.9%	48.0%
Large C&I	9.5%	41.5%	49.0%

Source: Information provided by the NSW electricity distributors

Focus group discussion guide

F

F.1 Residential and Business

Background

— The NSW Government released a plan in 2020 to make electricity in NSW cleaner. The roadmap coordinates this through use of large scale solar and wind farms, storage facilities, and new high voltage electricity lines.

— A survey is to be conducted to estimate the willingness of NSW electricity consumers to pay to have more of the new electricity infrastructure locally built and operated.

Objectives

— To assess potential respondents' reactions to the concepts and terminology to be used in the survey, with a view to improving survey wording / presentation.

Incentive and duration

— Incentive to be received: $70/$100

— Duration of focus group/interview: 60 minutes

F.2 Introduction (2 mins)

Introduction of research

Wallis Social Research has been commissioned by the NSW Government through ACIL Allen to conduct qualitative research with NSW electricity consumers. This will form part of a larger research project into understanding the views of NSW electricity consumers on the plans to change the electricity system in NSW. Thank you for agreeing to discuss your experiences with me today.

The focus group should run for up to 60 minutes.

Recording and confidentiality

The information you give us in this discussion may form part of the report, which may be released publicly. The report will not identify you personally. Your information will be provided to ACIL Allen, but in a deidentified format. You do not have to answer any question that makes you feel uncomfortable. Would you like to continue?

Consent for recording

We would like to record this discussion to make sure we correctly capture the information you have provided. Again, you will not be identified in the final report or in any information passed back to ACIL Allen, even if direct quotes are used. Do you provide consent for us to record this interview/focus group?

Usage and storage of data

Wallis collects personal information from people who participate in market and social research studies. This information is collected in keeping with the Australian Market and Social Research Society's Code of Professional Behaviour, which guarantees anonymity to respondents, and the Privacy Act 1988 (Cth) which sets out rules about the way in which personally identified information on individuals is to be collected, stored, transferred and used.

Any questions before starting?

F.3 Personal introductions (5 mins)

F.3.1 Name / Hobbies / Occupation

- Moderator begins with answers to these questions to get the ball rolling
- Names…
- What is your position at the company/business?
- What industry are you a part of / what does the business you work for/own do?
- How would you describe the people at your workplace?
- How do you like to spend your time?
- What do you do for work?
- What hobbies do you have?
- Any other stuff they want to share about themselves/business

F.4 Electricity use in the household/business (5 mins)

F.4.1 Energy Use

- Do you consider your household/business big energy users?
- Who/What are the biggest energy users in your household/business?
- Do you/your business use solar/other forms of clean/renewable energy?

F.5 Views on clean energy (25 mins)

F.5.1 Views/experiences with clean energy– 10 minutes

- What clean energy sources are you aware of?
- How would you describe your views on clean energy?
- How important is it that NSW moves towards providing more energy through the use of renewables?
  - Why do you say that?

F.5.2 Views on the future of NSW energy

- If NSW were to move more to renewable energy sources, how do you imagine the infrastructure would be built?
  - Do you think moving to renewable energy sources is likely to mean your electricity bills are lower or higher in the short-to-mid-term?
    - Do you think they may be lower or higher in the long term?
  - If more of the infrastructure for renewable energies was built and operated by Australians through their own resources, would that make it more appealing?
    - Why or why not?
    - What do you think is meant by built? What is meant by operated?
    - Can you think of any benefits of having more of the energy infrastructure built and operated by Australians?
      - PROMPTS: Capacity building? Self-sufficiency? Employment opportunities? Skills development? Apprentice/trainee pipeline? Groups who could be targeted for skills development? Increased participation by First Nations people? Flow on benefits to other local businesses?

- Benefits/costs in the short to mid-term (1-10 years)? Benefits/costs in the long term (longer than 10 years)?

— Would you be willing to pay extra on your electricity bill to increase how much of the new energy infrastructure is built and operated by Australians (without changing how much electricity you use)?
  - How much extra?
  - How much extra would be too much?
  - How much extra would be acceptable for your budget?
  - What is the most you would be willing to pay?

F.6 Messaging (15 mins)

Moderator introduces the subject: We're now going to talk about some of the messaging the NSW government is considering using as part of a survey on the plan to change the way electricity is delivered in NSW.

F.6.1 Cleaner electricity

Moderator reads out: The NSW Government has developed a roadmap to make NSW electricity cleaner. One of the messages in the survey is that the plan will *"Modernise the NSW electricity system to make it cleaner".*

— What do you think this means?

— Do you think it will be effective? Why or why not?

F.6.2 Least cost

Moderator reads out: One potential approach to modernising the electricity system is known as the 'least cost approach'.

— In your own words, what do you think the 'least cost approach' means in terms of modernising the energy system?

[If there are misunderstandings / ambiguity re: least cost] Moderator read out: Earlier in the discussion, we spoke about various investments which could be made to modernise the electricity system which may have broader social and economic benefits – such as **[as appropriate:]** employing local people, developing skills for certain groups, and improving NSW's self-sufficiency. The alternative to this approach is one where the focus is on keeping costs to electricity consumers down – imported materials are used if they are cheaper than locally produced materials. This could be described as a 'least cost' approach.

— What other phrases might you use to describe this approach?

F.7 Closing Thoughts (5 mins)

— Anything further?

Questionnaire G

INTRODUCTION - CATI

Good morning/afternoon/evening. I'm [INT_NAME] from Wallis Social Research. We're calling on behalf of The New South Wales Government to complete a confidential survey looking at attitudes towards proposed changes to transform the New South Wales electricity system. The outcomes of the research will have different impacts on local industry, employment, national resilience, and electricity bills.

[IF NECESSARY]: The New South Wales Government department is the Department of Planning, Industry and Environment.

[IF RESIDENTIAL SAMPLE] Am I speaking with the decision maker or joint decision-maker on major financial decisions for the household?

[IF BUSINESS SAMPLE] Am I speaking with the owner or person responsible for making major business decisions?

[IF MOBILE PHONE]: I realise I'm calling you on your mobile, can I just check that it's okay to talk at the moment and that you're not driving? **[IF DRIVING OR NOT SAFE, MAKE APPOINTMENT]**

Are you able to participate, either now or at a more convenient time? We can also send you a link to complete the survey online if you prefer that.

[IF BUSINESS SAMPLE] For the following questions we would like you to answer from your perspective as a business owner / manager and in relation to your business premises as opposed to your personal perspective or home / residential premises.

IF NECESSARY: Wallis works within the Australian Privacy Act which means that all personal information that we collect and store is protected. You can find out more in our Privacy Policy which is available on our website www.wallis.social/privacy.

01	CONTINUE (START SURVEY)	
02	Wants to do online – provide link via email or text	**GO TO L1**
42	Will do online – already has link	**GO TO APT**
41	Make appointment	**GO TO APT**
17	Update details	
04	Respondent not available during survey period	
10	Refused	
91	Refused – Add to Do Not Call List	
11	Language difficulties	
07	Wrong number	
61	Business no longer in operation	

SENDING LINK – IF MULTI-MODE

L1 Would you like us to send that to you via email or text?

01 Email
02 SMS

L2 Can I please confirm…

01 Your name:
02 IF L1=01: Your email address:
03 IF L1=02: Your mobile number:

POST L2 GO TO APT

IN SURVEY EMAIL & SMS TEXT

Email

Subject: Research on behalf of NSW Government – Requested email (ID: [PIN])

Dear [FNAME],

Thank you for speaking with one of our interviewers earlier regarding the research we are doing on behalf of the NSW Government about attitudes to local content requirements for transforming NSW's electricity system. As requested, please find below a link to the survey below:

[SURVEY LINK]

We understand your time is valuable and we appreciate your participation. One of our interviewers may contact you by phone if you don't complete the survey in the next couple of days.

If you require any assistance with the survey, contact Wallis on 1800 113 444 or email surveys@wallisgroup.com.au quoting your ID number [PIN] and the project number 4897.

Regards,

Wallis Social Research

SMS

Hi [Name], please go to [SURVEY LINK] to complete the local content requirement for electricity infrastructure survey. For more info call Wallis on 1800113444

INTRODUCTION - ONLINE

SURVEY NAME: Renewable energy sector local content requirement Survey

Thank-you for your interest in this confidential survey. Wallis Social Research is conducting this survey on behalf of the NSW Government. Your participation is voluntary, and greatly valued. This survey is looking at the attitudes to local content requirements for transforming NSW's electricity system.

The survey takes around 10 minutes to complete.

If you require any further information about the survey or if you'd like to find out how we manage your personal information, you can call Wallis on 1800 113 444 or view the Wallis Privacy Policy here or linked below.

If any of the survey themes or questions make you feel distressed or uncomfortable, there is some helpline information linked below (see 'Support Services').

As you move through the survey, please do not use your browser "forward" and "back" buttons - instead use the buttons at the bottom of each screen.

Please click "Next" to begin.

MONITORING QUESTION

MONITOR With your permission, the call will be recorded and may be monitored for quality control purposes. If you do not want the call to be recorded or monitored, please say so now.

DO NOT READ OUT

01 Recording and monitoring allowed
02 Recording or monitoring NOT allowed

SCREENER

S1 What is your postcode?

Please specify your four-digit postcode below

<RECORD 4-DIGIT POSTCODE – ALLOW RELEVANT NSW POSTCODES>

98 (DO NOT READ) Prefer not to say **GO TO TERM1**

S2 Are you connected to the electricity grid?

01 Yes
02 No **GO TO TERM2**

PRES2B IF BUSINESS SAMPLE, CONTINUE. ELSE, GO TO S3.

S2b And to confirm, is this number that we called a registered business?

01 Yes
02 No

S2c Do you also live at this address?

01 Yes
02 No

PROGRAMMER NOTE: IF S2B=02, RE-CLASSIFY AS RESIDENTIAL FROM NOW.

S3 **[**What is your age? **/** Which of the following age groups are you in?**]**

PROMPT IF NECESSARY / Please select one option below

01 Under 18 **GO TO TERM3**
02 18-30
03 31-40
04 41-50
05 51-60
06 61-68
07 69 or older
98 (DO NOT READ) Prefer not to say

S4 What is the highest level of education you have completed?

PROMPT IF NECESSARY

01 Primary School
02 Secondary School but not year 12
03 Secondary School including year 12
04 TAFE/Technical college
05 Undergraduate qualification
06 Post graduate degree
95 Other (specify / please specify)
98 Prefer not to say

S5 How do you describe your gender?

PROMPT IF NECESSARY

01 Man or male
02 Woman or female
03 Non-binary
95 I use a different term (specify / please specify)

PREQ6 IF RESIDENTIAL SAMPLE, CONTINUE. ELSE, GO TO S8.

S6 Do you operate a business from your home address?

PROMPT IF NECESSARY

01 Yes
97 No

PRES7 IF S6=01, CONTINUE. ELSE, GO TO A1.

S7 Is the **majority** of your electricity usage at these premises for residential or **BUSINESS** purposes?

PROMPT IF NECESSARY

01 Residential purposes
02 Business purposes

PROGRAMMER NOTE:

IF S7=01 CLASSIFY AS RESIDENTIAL (CHECK QUOTAS)
IF S7=02 CLASSIFY AS BUSINESS (CHECK QUOTAS)

PRES8 IF 'BUSINESS', CONTINUE. ELSE, GO TO A1.

S8 How many people are employed in your business?

Prompt for number and enter number. If no number given, then prompt again for ballpark figure.

95 **<ALLOW 0-10000>** RECORD NUMBER / Please specify the number of employees

96 (If no number given after prompt) Less than 500

97 (if no answer provided after prompt) More than 500

98 Prefer not to say

PROGRAMMER NOTE: IF S5 IS =<200 PRESENT POSTS8A

POSTS8a For the following questions we would like you to answer from your perspective as a business owner / manager and in relation to your business premises as opposed to your personal perspective or home / residential premises.

PROGRAMMER NOTE: IF S5 IS >200 PRESENT POSTS8B

POSTS8b For the following questions we would like you to answer in relation to your residential address as opposed to your business premises.

SECTION A: Electricity Bill

A1 Next we have a few questions about your last electricity bill.

How much was your last electricity bill?

(Please note: if you receive a feed-in tariff (for example because of rooftop solar panels), please provide the amount of the bill before the feed-in tariff is applied, if possible)

IF NECESSARY: We are asking for the dollar amount, so we can present you with scenarios that are realistic and relevant for you later in the survey. The purpose of the research is to understand your views on transforming the NSW electricity system to be cleaner.

RECORD EXACT WHOLE DOLLAR AMOUNT (or to nearest $10 if respondent not sure) / Please enter a whole dollar amount (to the nearest $10 is fine)

95 **<ALLOW $1-$100000>** SPECIFY / please specify
99 (DO NOT READ) Don't know
98 (DO NOT READ) Prefer not to say

PREA2 IF A1= 98/99, CONTINUE. ELSE, GO TO A3.

A2 It is really important for this survey that you have an idea of the size of your last electricity bill. Can you now locate your most recent electricity bill, to tell us what it was?

(Please note: if you receive a feed-in tariff (for example because of rooftop solar panels), please provide the amount of the bill before the feed in -tariff is applied, if possible)

RECORD EXACT WHOLE DOLLAR AMOUNT (or to nearest $10 if respondent not sure)

95 Yes **<ALLOW $1-$100000>** (SPECIFY / Please enter a whole dollar amount (to the nearest $10 is fine))
02 No **GO TO TERM5**
03 My bill is zero (or a credit) **GO TO TERM6**

A3 Was this electricity bill for a…

READ OUT

01 Month
02 Quarter

A4 How difficult is it for you to pay your electricity bill. Would you say that it is …

READ OUT

01 often difficult for you to pay your bill on time
02 sometimes difficult for you to pay your bill on time
03 rarely difficult for you to pay your bill on time
04 never difficult for you to pay your bill on time
98 (DO NOT READ) prefer not to answer

Prea5 The NSW Government has released a roadmap to transform the NSW electricity system so that is cleaner. The Roadmap will coordinate investment in wind and solar farms, pumped hydro storage and transmission lines as ageing coal-fired plants retire. The next few questions are going to ask how important certain aspects of the Roadmap are for you.

A4 How important is it to you…

a) that the NSW electricity system is transformed so that it is clean?
b) that the NSW electricity system is transformed at the lowest cost for consumers?
c) the NSW electricity system is transformed using as much locally produced materials as possible?
d) that the NSW electricity system is transformed using as much labour from the local area as possible?
e) apprentices and trainees contribute to transforming the NSW electricity system?
f) First Nations people contribute to transforming the NSW electricity system?
g) Australia builds local manufacturing capacity to improve our resilience?

Would you say it is…

READ OUT

01 Very important
02 Important
03 Neither important not unimportant
04 Unimportant
05 Not important at all
98 (DO NOT READ) Prefer not to say

Section B: Comparisons

BI The next few questions are about your preference for increasing the use of locally produced materials, the number of apprentices and trainees, the number of local workers and the contribution of First Nation peoples to transforming the NSW electricity system, without changing the way you use electricity.

Please note that these are simply ideas being explored. They will not necessarily be introduced.

[For the next few questions, I will read out / Next will display**]** six/eight possible scenarios.

We would like you to give us a score between 0 and 10 for how **much you prefer** each scenario **compared to** the lowest cost approach. The lowest cost approach means **undergoing the project at the lowest possible cost** to electricity users by sourcing materials from wherever provides them at the lowest cost.

In each of these scenarios, a score of **5** means that the scenario you have been presented is **equal to the lowest cost approach** for your preference. A score of 0 **means you do not prefer** the scenario to the lowest cost approach at all. A score of 10 **means you much prefer** the scenario to the lowest cost approach.

The scenarios may sound repetitive when you first [hear/look at them], but some parts will change, if only slightly. We'll happily repeat the scenario details if you don't remember some parts. Please look carefully at these as you rate them.

Remember that the lowest cost has a score of 5 (five).

B1 On a scale of 0-to-10, what score would you give this approach, in comparison with the current lowest cost approach having a score of 5?

IF NECESSARY: The score of 5 is the lowest cost approach. The lowest cost approach is defined as transforming the electricity system at the lowest cost to electricity users. This means that imported materials are used if they are cheaper than locally produced materials.

ITEMS; PROGRAMMER SEE BACK OF QUESTIONNAIRE FOR SCENARIO DETAIL; RANDOMISE; RANDOMLY ALLOCATE [6 OR 8] TO EACH RESPONDENT

A	SC1
B	SC2
C	SC3
D	SC4
E	SC5
F	SC6
G	SC7
H	SC8
I	SC9
J	SC10
K	SC11
L	SC12
M	SC13
N	SC14
O	SC15
P	SC16

RESPONSE SET;

PROMPT IF NECESSARY

00	0 - 'Compared to the current lowest cost approach, you would **not prefer** this alternative approach at all'
01-09	
10	10 – 'Compared to the current lowest cost approach, you would **much prefer** this alternative approach'

CLOSE

Thank you for your time, those are all the questions we have for you today. This research is carried out in compliance with the Privacy Act, and the information you provided will be used for research purposes only.

[My name is [INT_NAME] from Wallis Social Research and this survey was undertaken **/** This survey was undertaken by Wallis Social Research**]** on behalf of the NSW Government.

If you require any further information about the survey or if you'd like to find out how we manage your personal information, you can call Wallis on **1800 113 444** or view the Wallis Privacy Policy at www.wallis.social/privacy.

Please click next to submit your answers

If any of the survey themes or questions made you feel distressed or uncomfortable. I can give you the phone number for mental health support.

BEYONDBLUE: 1300 22 4636

LIFELINE: 13 11 14

If you need to speak to someone for support, you can contact BeyondBlue on 1300 22 4636, or if you need urgent help, you can call LifeLine on 13 11 14. Alternative helpline information is also located at the bottom of your screen.

TERMINATIONS

TERM1	Sorry – you can only proceed with this survey if you are willing to provide a valid NSW postcode
TERM2	Sorry – you can only proceed with this survey if you are connected to the electricity grid
TERM3	Sorry – you can only proceed with this survey if you are aged 18 or over
TERM4	Sorry – you can only proceed with this survey if you are an operator of a small / medium business
TERM5	Sorry – you can only proceed with this survey if you are able to provide an estimate of your most recent electricity bill
TERM6	Sorry – you can only proceed with this survey if you are able to provide a non-zero estimate of your most recent electricity bill

SCENARIOS

SC1 1) The NSW electricity system is transformed using **somewhat more locally produced** materials
2) using more **apprentices and trainees**
3) The cost for electricity would **stay the same**

SC2 1) The NSW electricity system is transformed using **somewhat more locally produced** materials
2) using more workers from the **local area** and with a **higher contribution** from First Nations people
3) The cost for electricity would **stay the same**

SC3 1) The NSW electricity system is transformed using **as much locally produced** materials as possible, which increases Australia's manufacturing capacity and future resilience
2) The cost for electricity would **stay the same**

SC4 1) The NSW electricity system is transformed using **as much locally produced** materials as possible, increasing Australia's manufacturing capacity and future resilience
2) using more **apprentices and trainees** and with a **higher contribution** from First Nations people
3) The cost for electricity would **stay the same**

SC5 1) The NSW electricity system is transformed using **somewhat more locally produced** materials
2) with increased contribution from **First Nations** people
3) The cost of electricity would **increase** by 2%, that is by $**<[A1=95]*0.02 OR [A2=95]*0.02>** per **[A3=02:** quarter **/ A3=01:** month**]**

SC6 1) The NSW electricity system is transformed using **somewhat more locally produced** materials
2) using more workers from the **local area** and with a **higher contribution** from First Nations people
3) The cost of electricity would **increase** by 2%, that is by $**<[A1=95]*0.02 OR [A2=95]*0.02>** per **[A3=02:** quarter **/ A3=01:** month**]**

SC7 1) The NSW electricity system is transformed using **as much locally produced** materials as possible, which increases Australia's manufacturing capacity and future resilience
2) The cost of electricity would **increase** by 2%, that is by $**<[A1=95]*0.02 OR [A2=95]*0.02>** per **[A3=02:** quarter **/ A3=01:** month**]**

SC8 1) The NSW electricity system is transformed using **as much locally produced** materials as possible, which increases Australia's manufacturing capacity and future resilience
2) using more workers from the **local area**
3) The cost of electricity would **increase** by 2%, that is by $**<[A1=95]*0.02 OR [A2=95]*0.02>** per **[A3=02:** quarter **/ A3=01:** month**]**

SC9 1) The NSW electricity system is transformed using **somewhat more locally produced** materials
2) using more **apprentices and trainees**
3) The cost of electricity would **increase** by 4%, that is by $**<[A1=95]*0.04 OR [A2=95]*0.04>** per **[A3=02:** quarter **/ A3=01:** month**]**

SC10 1) The NSW electricity system is transformed using **somewhat more locally produced** materials
2) using more workers from the **local area** and with a **higher contribution** from First Nations people
3) The cost of electricity would **increase** by 4%, that is by $**<[A1=95]*0.04 OR [A2=95]*0.04>** per **[A3=02:** quarter **/ A3=01:** month**]**

SC11 1) The NSW electricity system is transformed using **as much locally produced** materials as possible, which increases Australia's manufacturing capacity and future resilience
3) The cost of electricity would **increase** by 4%, that is by $**<[A1=95]*0.04 OR [A2=95]*0.04>** per **[A3=02:** quarter **/ A3=01:** month**]**

SC12 1) The NSW electricity system is transformed using **as much locally produced** materials as possible, which increases Australia's manufacturing capacity and future resilience
2) using more **apprentices and trainees** and with increased contribution from **First Nations** people
3) The cost of electricity would **increase** by 4%, that is by $**<[A1=95]*0.04 OR [A2=95]*0.04>** per **[A3=02:** quarter **/ A3=01:** month**]**

SC13 1) The NSW electricity system is transformed using **somewhat more locally produced** materials
2) with increased contribution from **First Nations** people
3) The cost of electricity would **increase** by 8%, that is by $**<[A1=95]*0.08 OR [A2=95]*0.08>** per **[A3=02:** quarter **/ A3=01:** month**]**

SC14 1) The NSW electricity system is transformed using **somewhat more locally produced** materials
2) using more **apprentices and trainees** and with increased contribution from **First Nations** people
3) The cost of electricity would **increase** by 8%, that is by $**<[A1=95]*0.08 OR [A2=95]*0.08>** per **[A3=02:** quarter **/ A3=01:** month**]**

SC15 1) The NSW electricity system is transformed using **as much locally produced** materials as possible, which increases Australia's manufacturing capacity and future resilience
2) The cost of electricity would **increase** by 8%, that is by $**<[A1=95]*0.08 OR [A2=95]*0.08>** per **[A3=02:** quarter **/ A3=01:** month**]**

SC16 1) The NSW electricity system is transformed using **as much locally produced** materials as possible, which increases Australia's manufacturing capacity and future resilience
2) using more workers from the **local area** and with a **higher contribution** from First Nations people
3) The cost of electricity would **increase** by 8%, that is by $**<[A1=95]*0.08 OR [A2=95]*0.08>** per **[A3=02:** quarter **/ A3=01:** month**]**

Breakdown of costs by technology

H

This appendix provides a more detailed breakdown of the costs by technology under each scenario. A breakdown is provided during the construction or development phase in appendix H.1 and during the operating and maintenance phase in appendix H.2.

H.1 Construction or development phase

A breakdown of the costs by technology during the construction or development phase is illustrated in Figure H.1. The breakdown of costs by scenario is illustrated for each technology in the left pane and the change in the breakdown of costs relative to the base case is illustrated for each technology in the right pane. The costs for the generation technologies include the costs associated with the connection assets.

Under the base case, wind has a relatively high proportion of imported material (59 per cent). The proportion of imported material decreases in the modest local content scenario (to 36 per cent) and the proportion of local materials and local labour increases with the local assembly of rotors and nacelles and the local manufacture of wind towers and transmission towers for the connection assets. The proportion of imported material decreases further in the ambitious local content scenario (to 17 per cent) and the proportion of local materials and local labour increases further with the local manufacture of rotors and nacelles as well as the local manufacture of wind towers and the transformers and conductor for the connection assets.

The proportion of local materials and labour is higher for solar under the base case than for wind (35 per cent compared to 19 per cent) – it is assumed that 60 per cent of the costs of racking and mounting are local and the installation costs for solar are a higher proportion of the costs than for wind (21 per cent compared to 16 per cent), and a high proportion of the installation costs are assumed to be local (approximately 80 per cent). There is very little change in the composition of the costs for solar in the modest local content scenario compared to the base case – with only imported steel assumed to be substituted with local steel and local manufacture of the transmission towers for the connection assets assumed. There is a much greater change in the breakdown of the costs for solar under the ambitious local content scenario with an assumption that the solar modules, which comprise 30 per cent of the costs of solar PV, and the transformers and conductor for the connection assets assumed to be locally manufactured.

Pumped hydro storage has a higher local content than wind and solar under the base case (51 per cent), with a relatively high proportion of costs for civil work (37 per cent), pipework (11 per cent) and labour for the power station (7 per cent), which are predominantly locally supplied. The local content increases slightly under the modest local content scenario with imported steel substituted with local steel and local manufacture of the transmission towers for the connection assets assumed. The local content increases more significantly under the ambitious local content scenario with local manufacture of pumps/turbines, and the transformers and conductor for the connection assets, assumed.

Battery storage is assumed to have relatively low local content under the base case (19 per cent) as the batteries and cables, which comprise 74 per cent of the costs are assumed to be imported. The local content increases slightly under the modest local content scenario with imported steel substituted with local steel and local manufacture of the transmission towers for the connection assets assumed. The local content increases more significantly under the ambitious local content scenario with local manufacture of the batteries and cables, and the transformers and conductor for the connection assets, assumed.

The network augmentation costs include the costs associated with transmission lines, transformers, circuit breakers and substations. The proportion of costs associated with each of these components under the base case is provided in Table H.1. The majority of the network augmentation costs are associated with new transmission lines (77 per cent).

Table H.1 Composition of the network augmentation costs

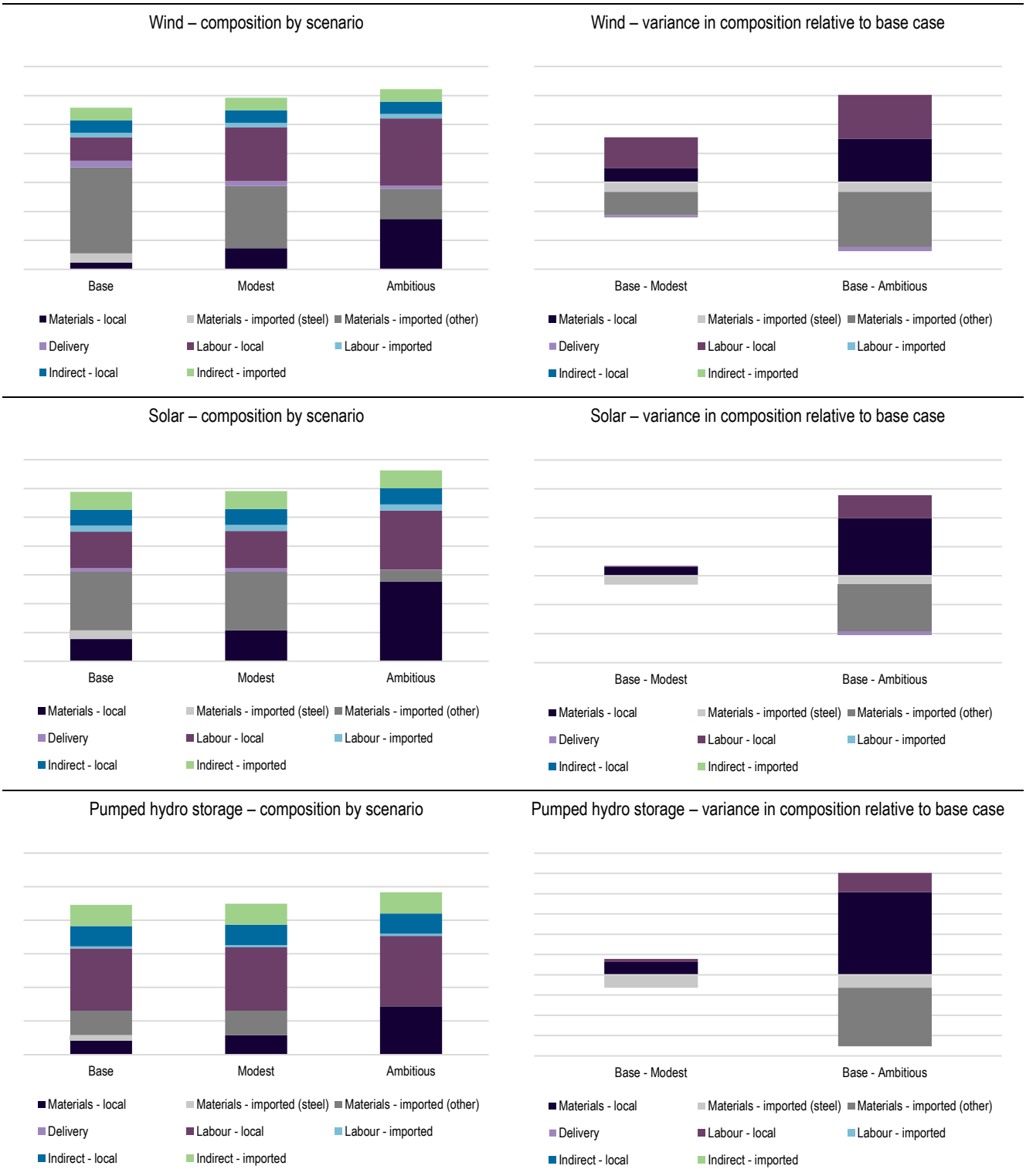
Component	Proportion of network augmentation costs
Transformer	5%
Transmission line	77%
Substation	5%
Circuit breaker	12%

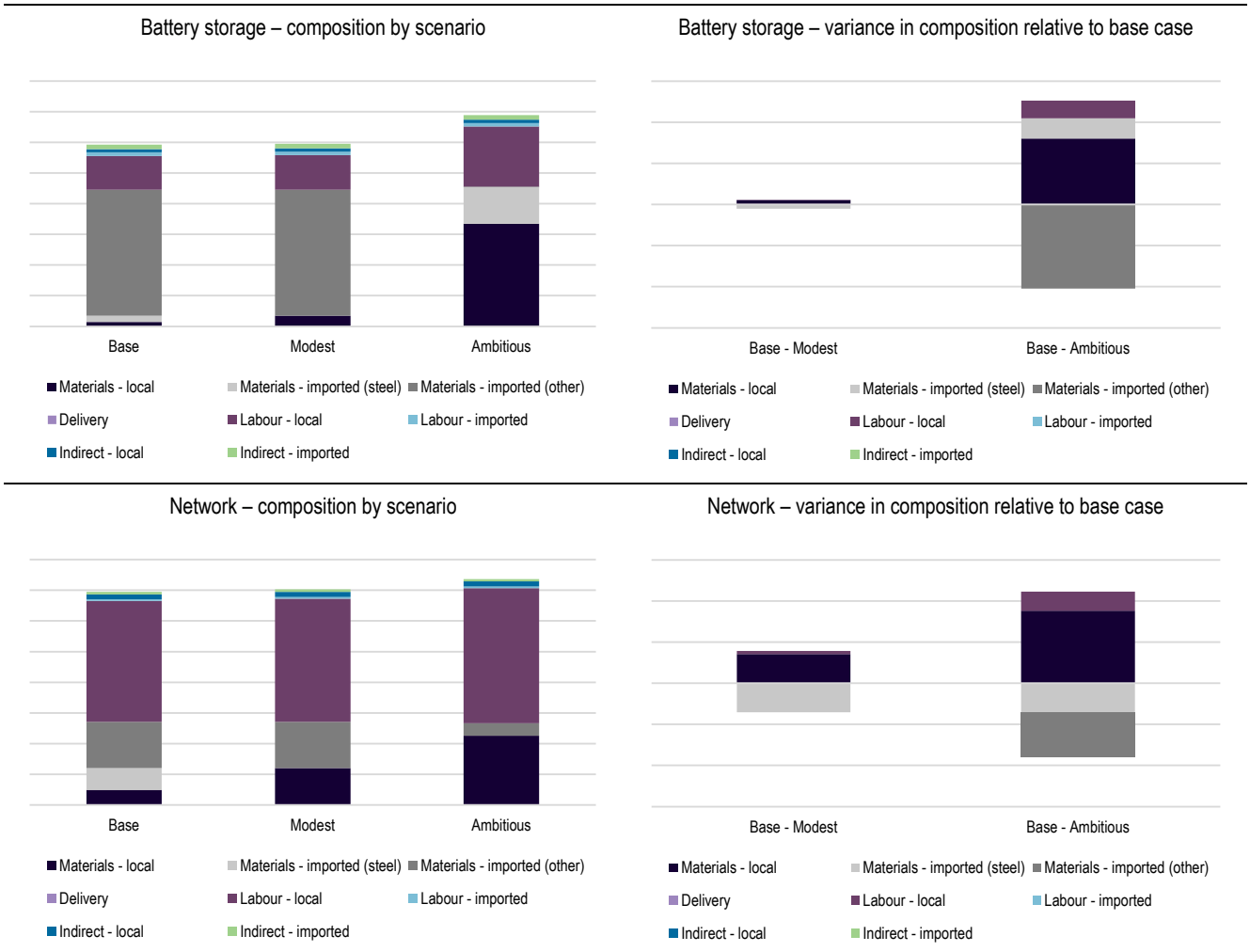
Source: ACIL Allen

The local content of network augmentations is relatively high, driven largely by the installation and environmental offset costs associated with transmission lines. The installation and environmental offset costs are estimated to be 64 per cent of the costs of transmission lines, and largely comprise local labour. The local content increases slightly under the modest local content scenario with imported steel substituted with local steel and transmission towers assumed to be locally manufactured. The local content increases more significantly under the ambitious local content scenario with local manufacture of conductors and cables and the smaller transformer (500 MVA) assumed.[73]

[73] There is only one 500 MVA transformer assumed for the network augmentations, with a much larger number required for the connection assets.

Figure H.1 Composition of technologies, development phase





Source: ACIL Allen

H.2 Operating and maintenance phase

A breakdown of the costs by technology during the operating and maintenance phase is illustrated in Figure H.2. The breakdown of costs by scenario is illustrated for each technology in the left pane and the change in the breakdown of costs relative to the base case is illustrated for each technology in the right pane. The costs for the generation technologies include the costs associated with the connection assets.

The operating and maintenance costs for each technology include a materials and a labour component. The breakdown of the materials component is assumed to be the same as the costs for the development phase. The change in the breakdown of the materials component is the same as for the development phase as discussed in appendix H.1.

For each technology, the labour component is assumed to be local labour. The costs associated with local labour are assumed to increase by 2 per cent under the modest local content scenario and 5 per cent under the ambitious local content scenario.

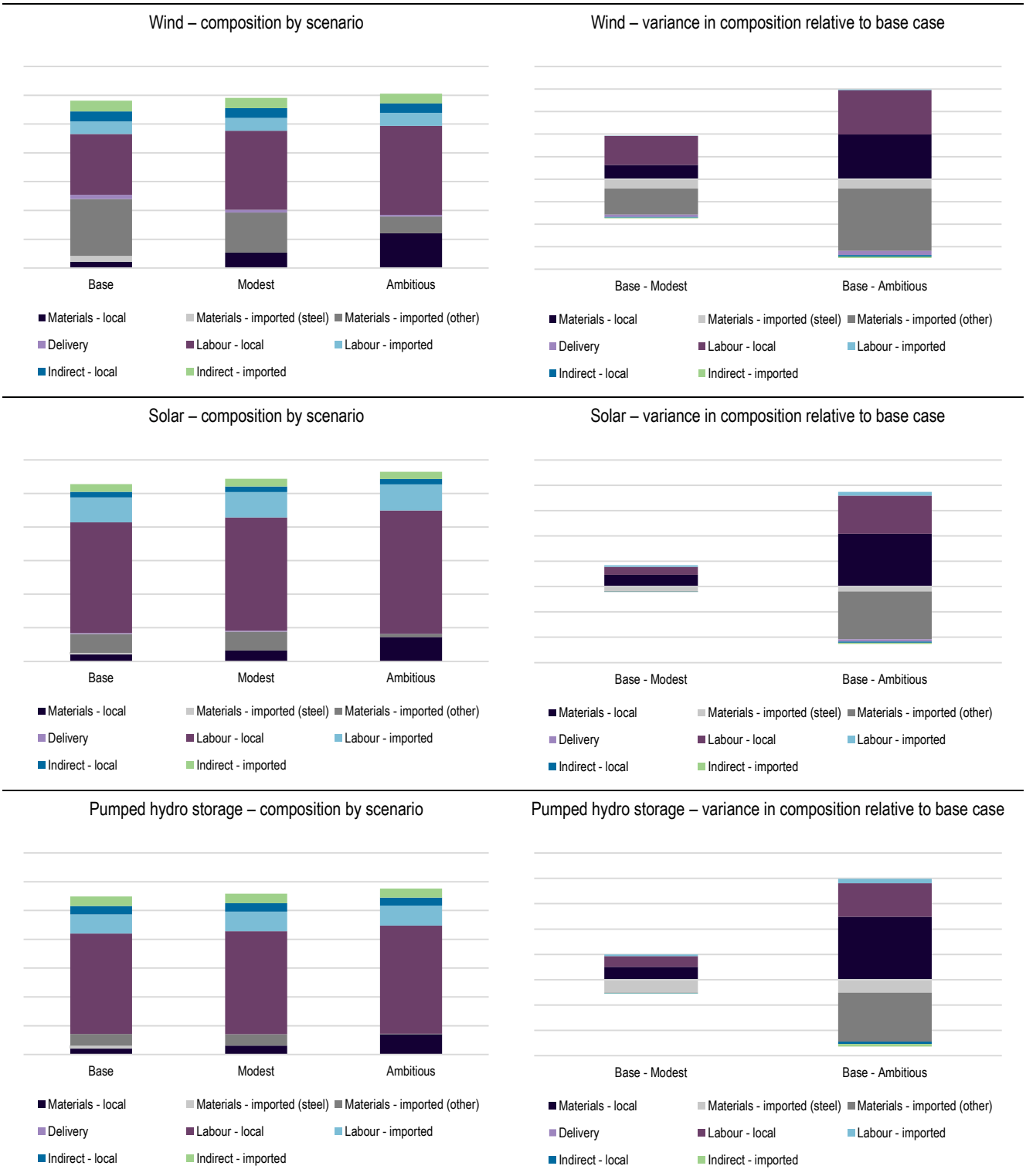
The materials component of the operating and maintenance costs for wind is relatively high (around 88-89 per cent depending on location under the base case). Accordingly, the breakdown of the operating and maintenance costs for wind is similar to the breakdown of the development costs, with similar changes from the base case to the modest local content scenario and the ambitious local content scenario as for the development phase.

The materials component of the operating and maintenance costs for solar is relatively low (around 24-26 per cent depending on location under the base case). Accordingly, a large proportion of the operating and maintenance costs for solar under each scenario are local labour costs (62 per cent under the base case and modest local content scenario, increasing to 65 per cent under the ambitious local content scenario).

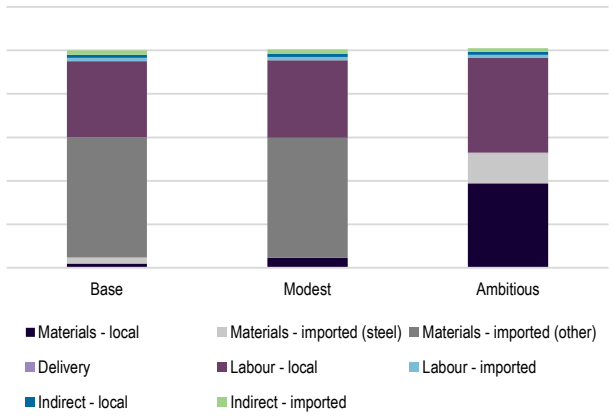
Local labour costs also represent and relatively high proportion of the operating and maintenance costs for pumped hydro storage (64 per cent under the base case and modest local content scenario and 65 per cent under the ambitious local content scenario) – labour represents 62 per cent of the operating and maintenance costs and labour also represents a relatively high proportion of the materials costs.

The materials component of the operating and maintenance costs for battery storage and network augmentation is relatively high (around 80 per cent and 67 per cent under the base case, respectively). Accordingly, the breakdowns of the operating and maintenance costs for battery storage and network augmentation are similar to the breakdown of the development costs, with similar changes from the base case to the modest local content scenario and the ambitious local content scenario as for the development phase.

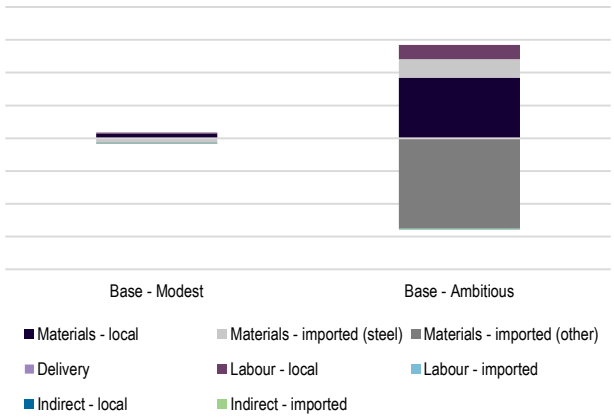
Figure H.2 Composition of technologies, operating and maintenance phase



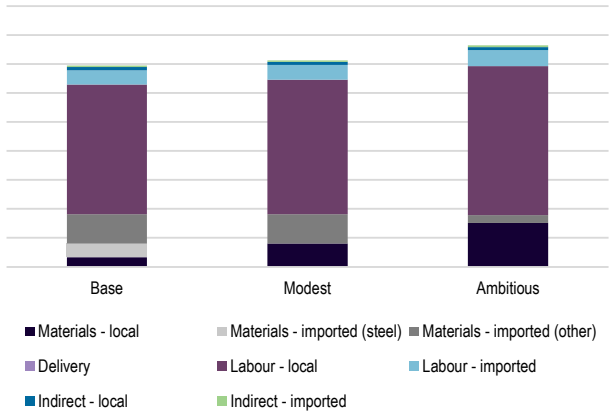
Battery storage – composition by scenario



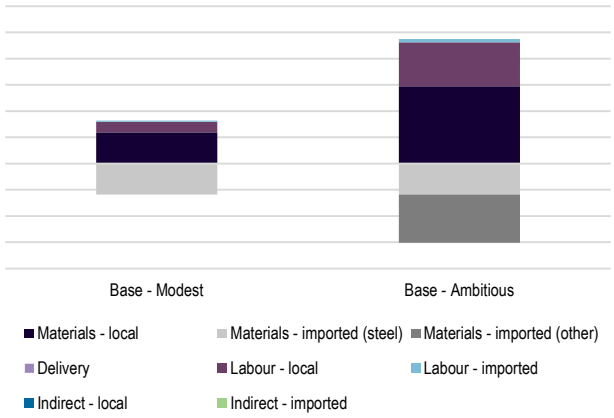
Battery storage – variance in composition relative to base case



Network – composition by scenario



Network – variance in composition relative to base case



Source: ACIL Allen

Customer research – results

I

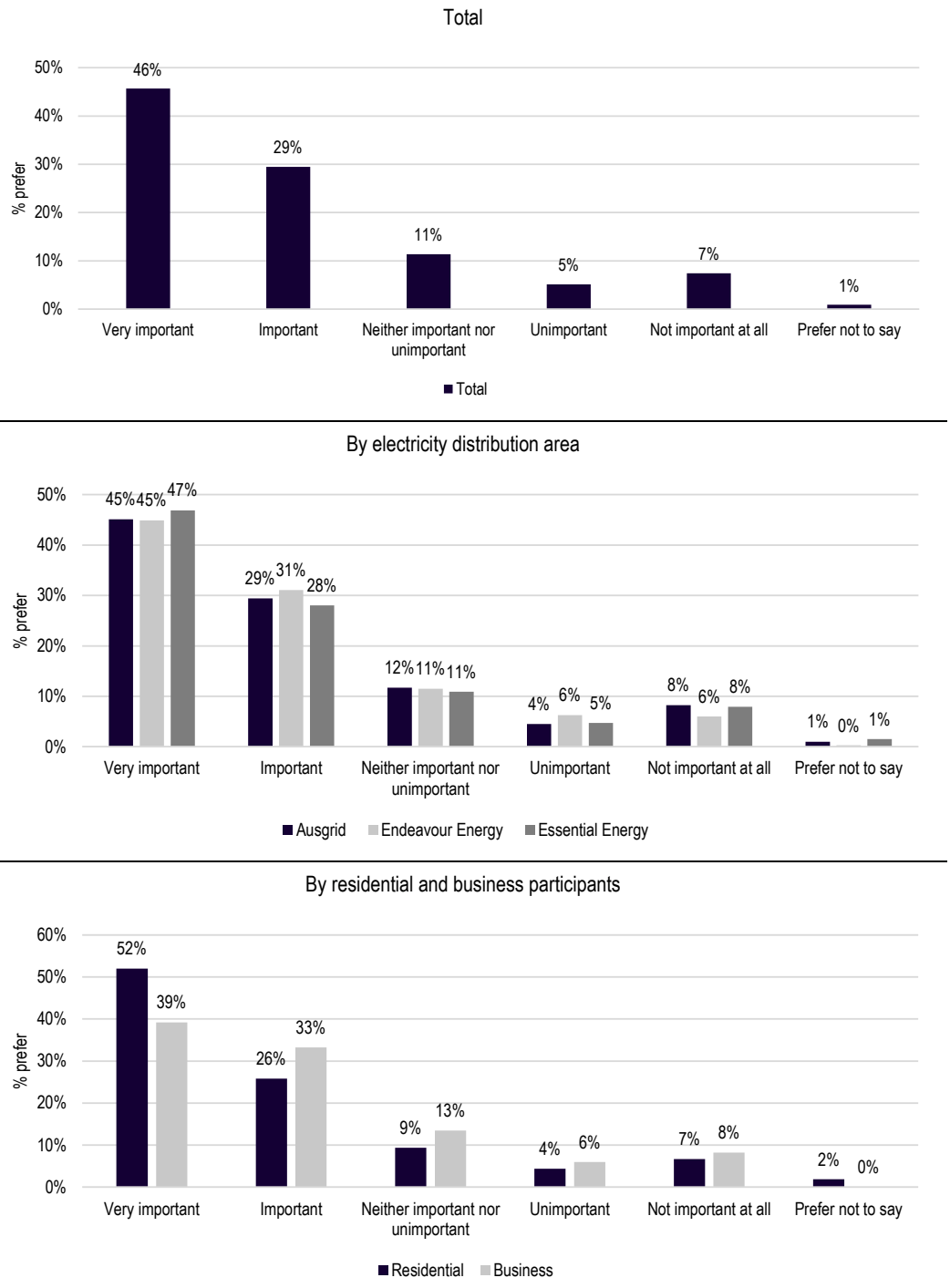
This appendix provides more detailed results from the customer research on the importance of various attributes associated with modernising the NSW electricity system (Appendix I.1) as well as key characteristics of the sample (Appendix I.2).

I.1 Relative importance of attributes

I.1.1 Transforming the NSW electricity system so that it is clean

The importance that the survey participants placed on transforming the NSW electricity system so that it is clean is illustrated in Figure I.1. 75 per cent of participants were of the view that it is very important or important to transform the NSW electricity system so that it is clean. More residential participants than business participants were of the view that it is very important or important to transform the NSW electricity system so that it is clean (78 per cent compared to 72 per cent).

Figure I.1 Importance of transforming the NSW electricity system so that it is clean



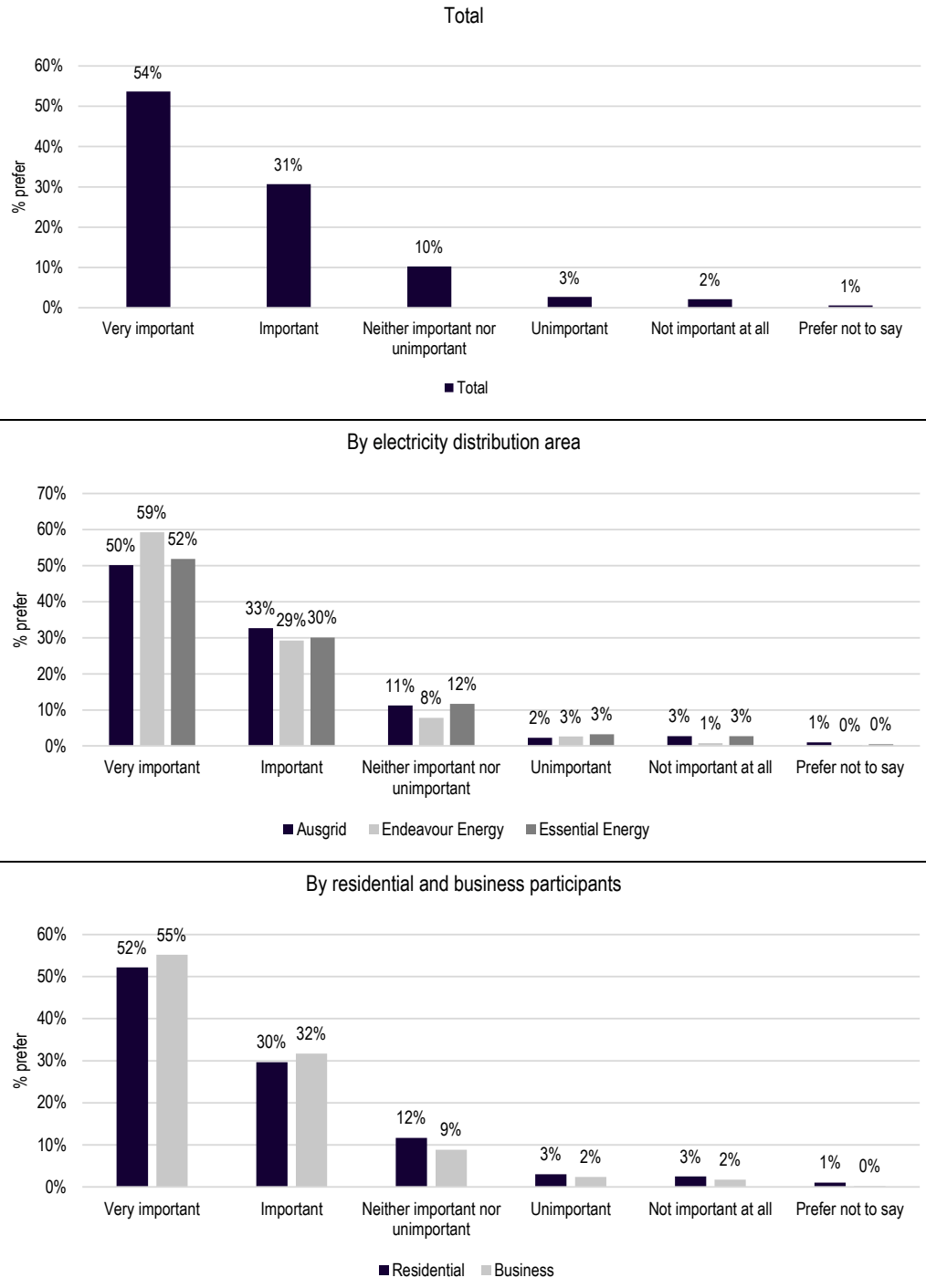
Source: ACIL Allen

I.1.2 Transforming the NSW electricity system at the lowest cost

The importance that the survey participants placed on transforming the NSW electricity system at the lowest cost is illustrated in Figure I.2. 84 per cent of participants were of the view that it is very important or important to transform the NSW electricity system at the lowest cost. A higher proportion of participants in Endeavour Energy's distribution area than in the other electricity distribution areas were of the view that it is very important or important to transform the NSW electricity system at the lowest cost (89 per cent compared to 82 per cent and 83 per cent). More business participants than residential participants were of the view that it is very important or

important to transform the NSW electricity system at the lowest cost (87 per cent compared to 82 per cent).

Figure I.2 Importance of transforming the NSW electricity system at the lowest cost



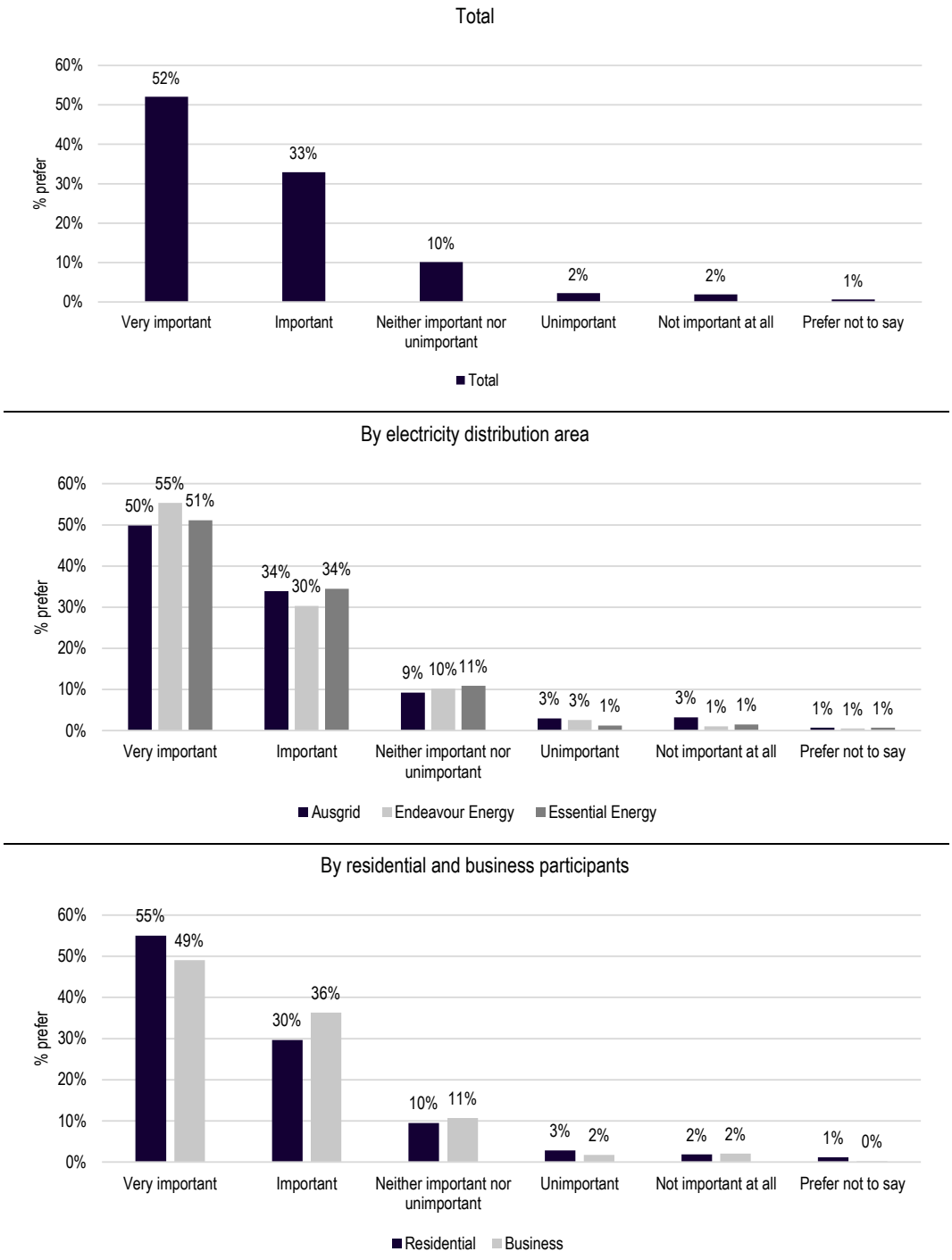
Source: ACIL Allen

I.1.3 Transforming the NSW electricity system using as much locally produced materials as possible

The importance that the survey participants placed on transforming the NSW electricity system using as much locally produced material as possible is illustrated in Figure I.3. 85 per cent of participants were of the view that it is very important or important to transform the NSW electricity

system using as much locally produced material as possible. The importance of transforming the NSW electricity system using as much locally produced material as possible was similar for participants across the electricity distribution areas and for residential and business participants.

Figure I.3 Importance of transforming the NSW electricity system using as much locally produced material as possible



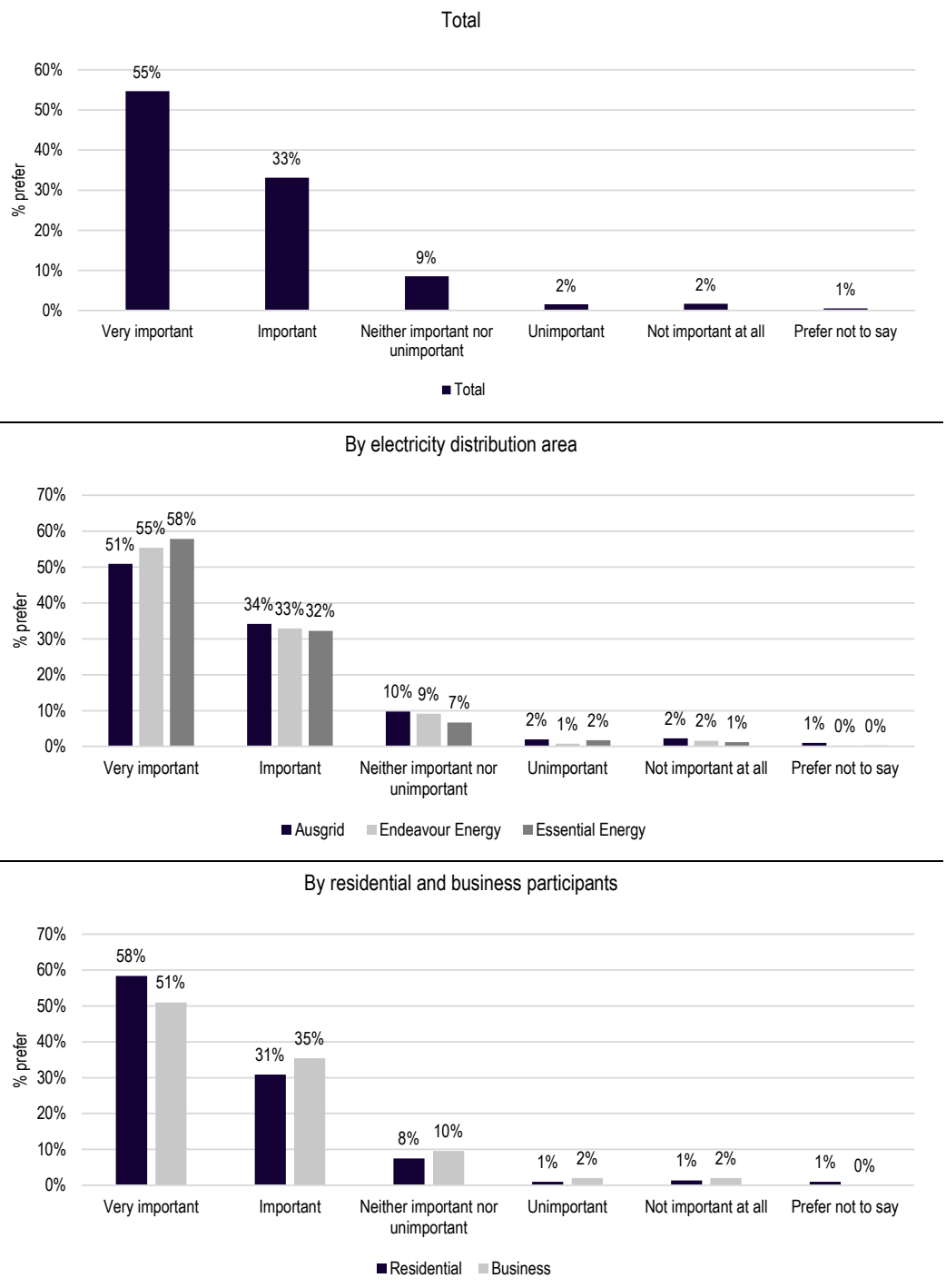
Source: ACIL Allen

I.1.4 Transforming the NSW electricity system using as much labour from the local area as possible

The importance that the survey participants placed on transforming the NSW electricity system using as much labour from the local area as possible is illustrated in Figure I.4. 88 per cent of

participants were of the view that it is very important or important to transform the NSW electricity system using as much labour from the local area as possible. A lower proportion of participants in Ausgrid's distribution area than in the other electricity distribution areas were of the view that it is very important or important to transform the NSW electricity system at the lowest cost (85 per cent compared to 88 per cent and 90 per cent). More residential participants than business participants were of the view that it is very important or important to transform the NSW electricity system using as much labour from the local area as possible (89 per cent compared to 86 per cent).

Figure I.4 Importance of transforming the NSW electricity system using as much labour from the local area as possible



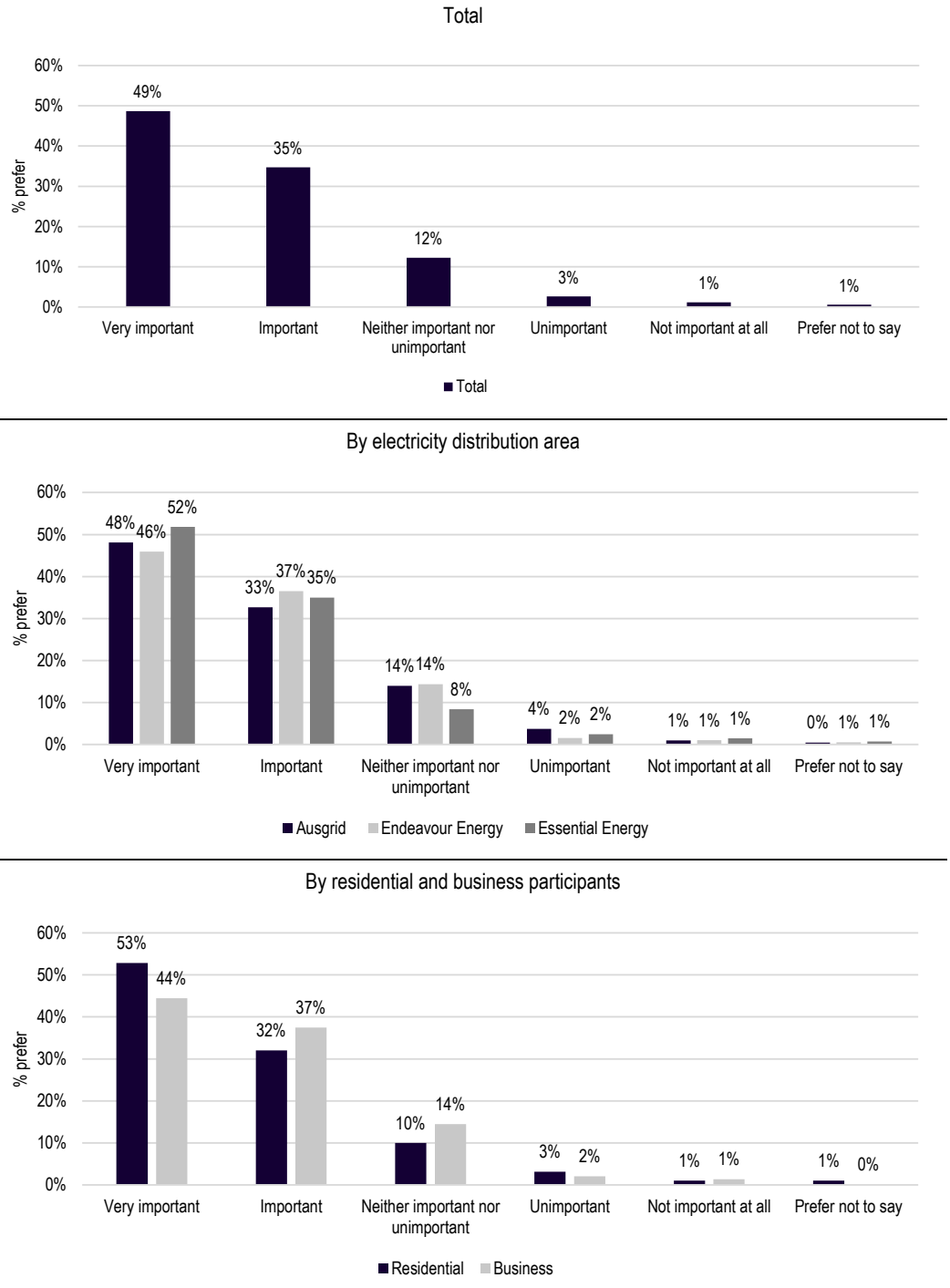
Source: ACIL Allen

I.1.5 Contribution of apprentices and trainees to transforming the NSW electricity system

The importance that the survey participants placed on apprentices and trainees contributing to transforming the NSW electricity system is illustrated in Figure I.5. 83 per cent of participants were of the view that it is very important or important for apprentices and trainees to contribute to transforming the NSW electricity system. More residential participants than business participants were of the view that it is very important or important for apprentices and trainees to contribute to

transforming the NSW electricity system (85 per cent compared to 82 per cent). The proportion of participants that were of the view that it is very important or important for apprentices and trainees to contribute to transforming the NSW electricity system was highest in Essential Energy's area (87 per cent) and lowest in Ausgrid's area (81 per cent).

Figure I.5 Importance of apprentices and trainees contributing to transforming the NSW electricity system

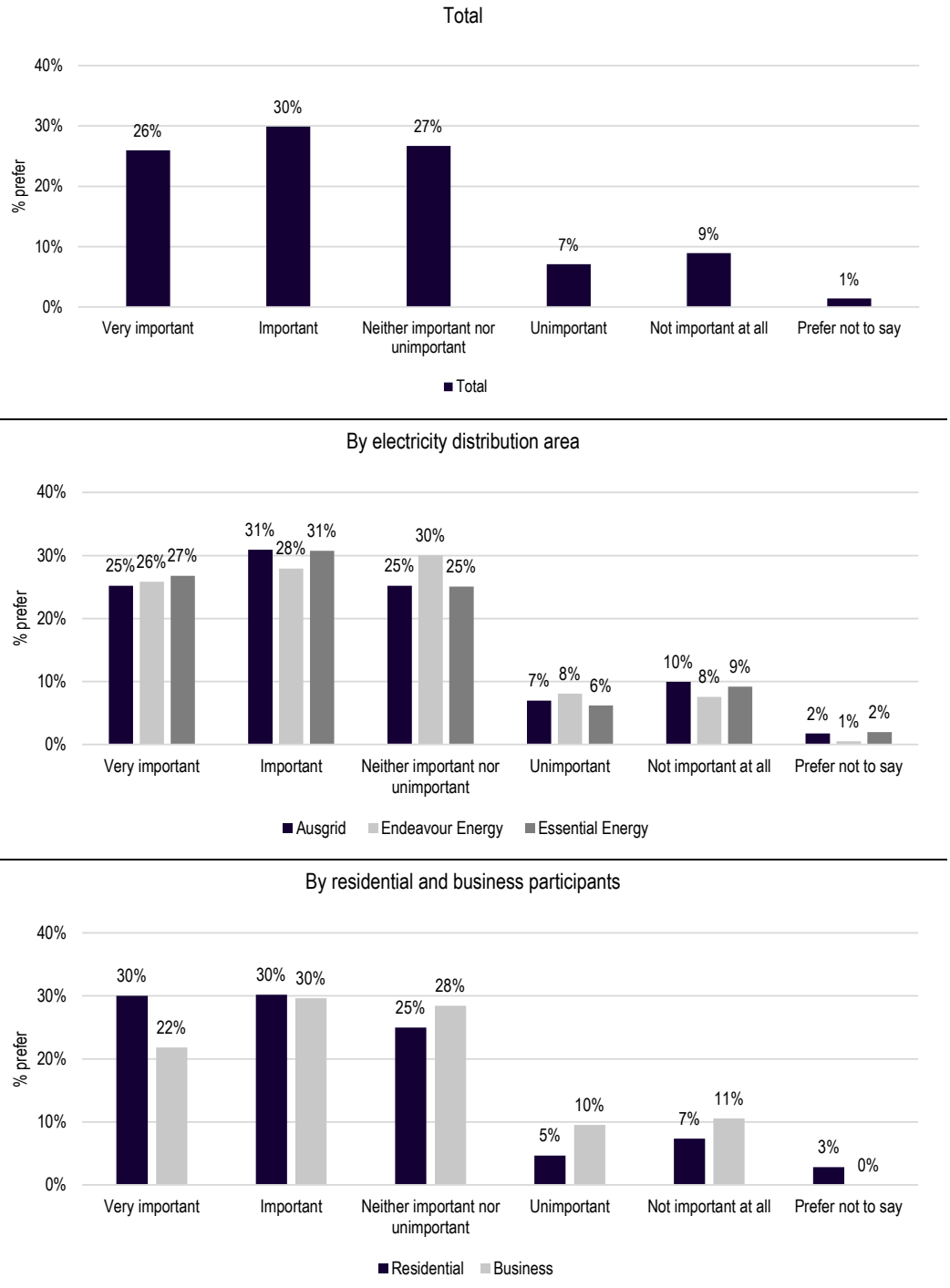


Source: ACIL Allen

I.1.6 Participation by First Nations people to transforming the NSW electricity system

The importance that the survey participants placed on First Nations people participating in transforming the NSW electricity system is illustrated in Figure I.6. A relatively low portion of participants (56 per cent) were of the view that it is very important or important for First Nations people to participate in transforming the NSW electricity system. A relatively high proportion of participants were of the view that it is neither important nor unimportant for First Nations people to participate in transforming the NSW electricity system (27 per cent).

Figure I.6 Importance of First Nations people participating in transforming the NSW electricity system

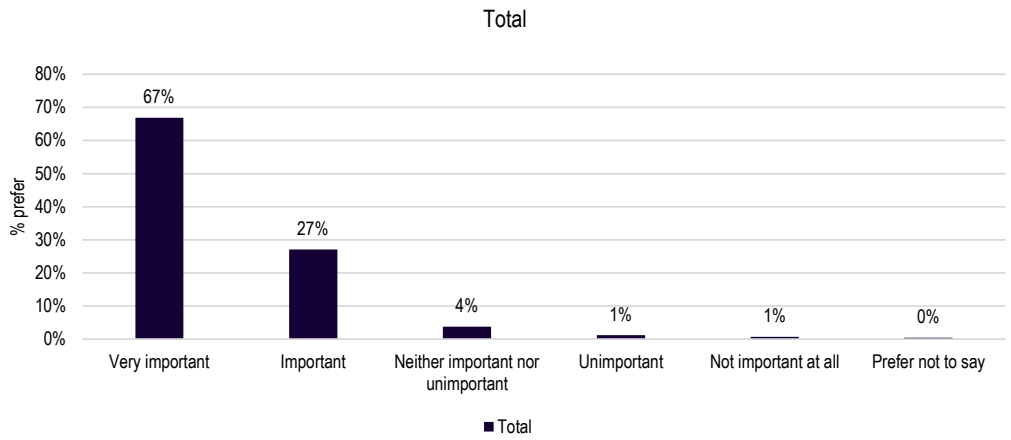


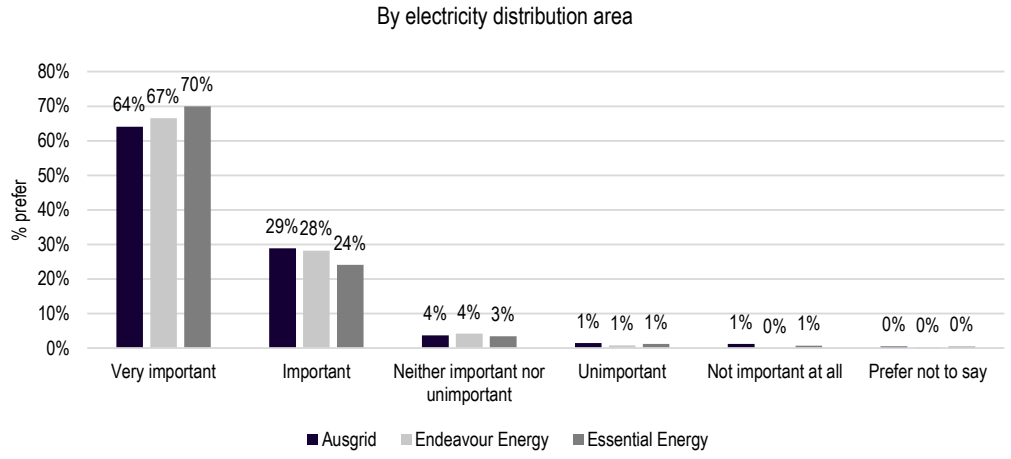
Source: ACIL Allen

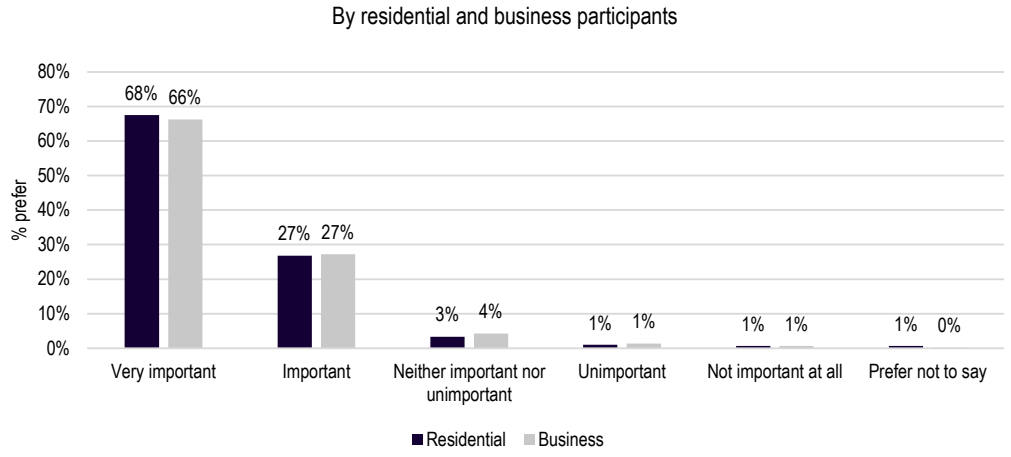
I.1.7 Building Australia's local manufacturing capacity to improve resilience

The importance that the survey participants placed on building Australia's local manufacturing capacity to improve resilience is illustrated in Figure I.7. A very high proportion (94 per cent) of participants were of the view that it is very important or important to build Australia's local manufacturing capacity to improve resilience.

Figure I.7 Importance of building Australia's local manufacturing capacity to improve resilience







Source: ACIL Allen

I.2 Key socio-demographic characteristics of the sample

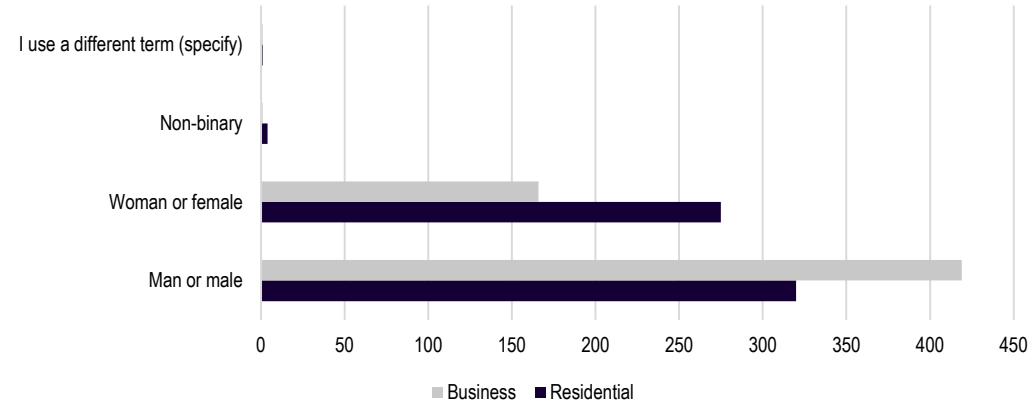
The key socio-demographic characteristics of the sample are gender, age and highest level of education.

I.2.1 Gender

Figure I.8 illustrates the gender profile of the sample. The overall sample is biased towards male participants – however this is mainly driven by the business participants. While the residential

participants are reasonably evenly distributed between male and female participants, 71 per cent of the business participants identified as man or male.

Figure I.8 Gender profile of sample

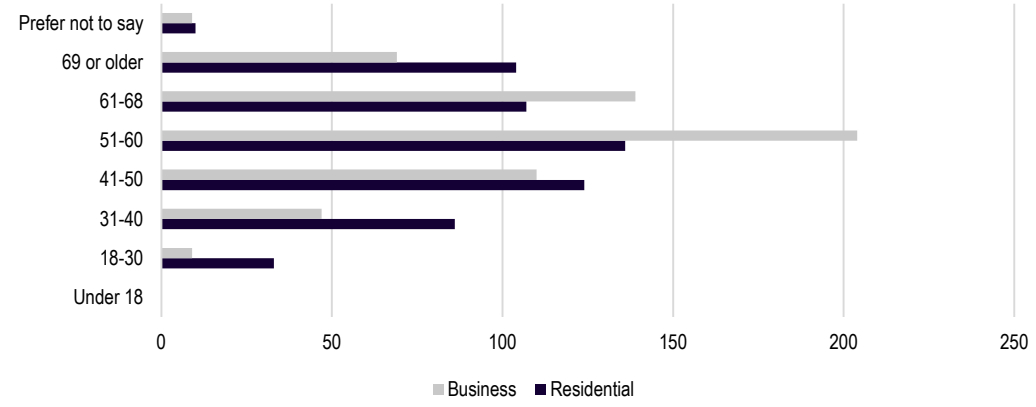


Source: ACIL Allen

I.2.2 Age

Figure I.9 illustrates the age profile of the sample. The age profile is reasonably consistent across the different age groups for the residential participants, with lower participation rates in the younger age groups. The age profile is skewed towards the 51-60 year age group for business participants.

Figure I.9 Age profile of sample

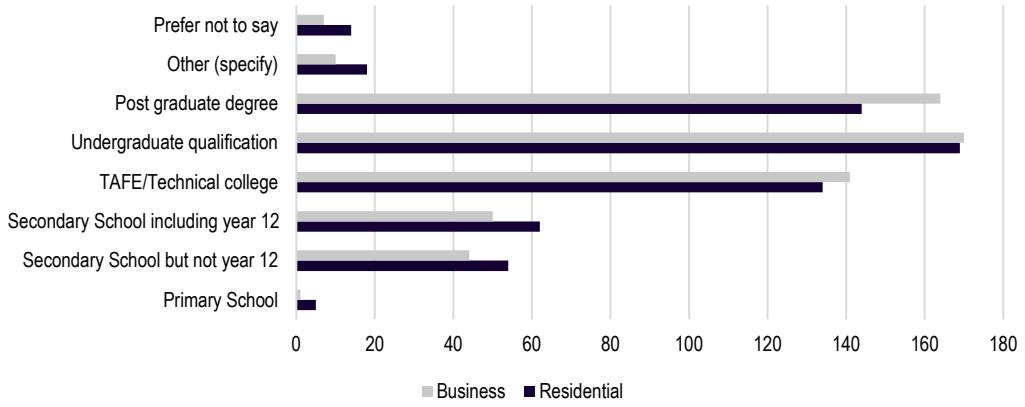


Source: ACIL Allen

I.2.3 Education

Figure I.10 illustrates the profile of educational attainment for the sample. The profile is similar for residential and business participants.

Figure I.10 Profile of educational attainment for the sample



Source: ACIL Allen

I.3 Participant's retail electricity bills

The minimum, average and maximum annual retail electricity bills of participants are set out in Table I.1.

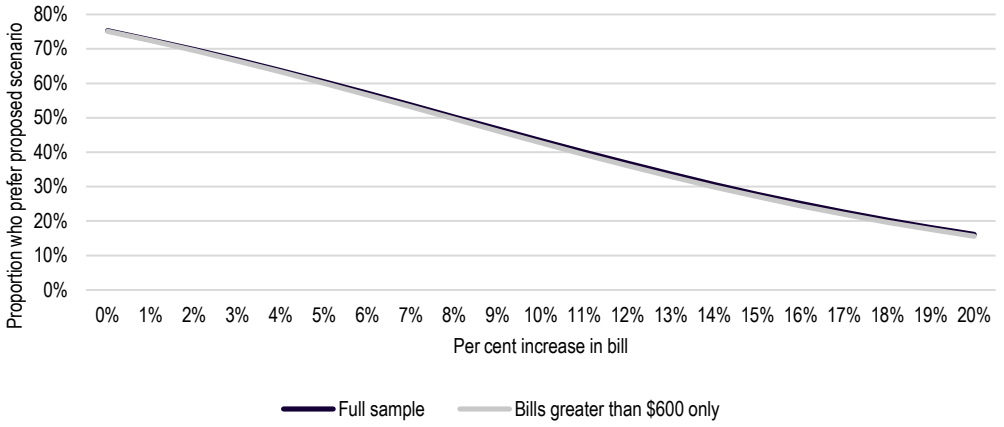
Table I.1 Participants' annual retail electricity bills

	Minimum	Average	Maximum
Residential participants			
Ausgrid	$120	$1,882	$8,000
Endeavour Energy	$40	$2,103	$12,400
Essential Energy	$40	$2,377	$24,000
Business participants			
Ausgrid	$40	$7,745	$176,000
Endeavour Energy	$40	$17,388	$474,960
Essential Energy	$600	$17,934	$504,000

Note: One residential outlier removed in each electricity distribution area
Source: ACIL Allen

The retail electricity bills for some participants were very low as they had rooftop solar. We estimated the willingness to pay for increases in local content for those with annual retail electricity bills greater than $600 and compared that to the willingness to pay for the total sample. Figure I.11 illustrates that the willingness to pay for increases in local content (as much locally produced material as possible) is not materially different for those with annual retail electricity bills greater than $600 as compared to the total sample. Accordingly, we did not exclude any participants from the willingness to pay analysis based on the size of their retail electricity bill.

Figure I.11 Willingness to pay for increases in local content, based on retail electricity bill



Source: ACIL Allen

Melbourne
Suite 4, Level 19; North Tower
80 Collins Street
Melbourne VIC 3000 Australia
+61 3 8650 6000

Sydney
Level 9, 50 Pitt Street
Sydney NSW 2000 Australia
+61 2 8272 5100

Brisbane
Level 15, 127 Creek Street
Brisbane QLD 4000 Australia
+61 7 3009 8700

Canberra
Level 6, 54 Marcus Clarke Street
Canberra ACT 2601 Australia
+61 2 6103 8200

Perth
Level 12, 28 The Esplanade
Perth WA 6000 Australia
+61 8 9449 9600

Adelaide
167 Flinders Street
Adelaide SA 5000 Australia
+61 8 8122 4965

ACIL Allen Pty Ltd
ABN 68 102 652 148

acilallen.com.au