



Good Earth Green Hydrogen
and Ammonia:
Economic Impact Analysis

**Project undertaken for
Hiringa Energy**
August 2022
(Addendum update October 2024)

Hiringa Energy GEGHA Project: Economic Impact Analysis

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RESOURCES

All modelling has been undertaken using REMPLAN™ software that has been authored by Principal Research Fellow (ret.), Ian Pinge, at La Trobe University Bendigo.

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1 Introduction

1.1 Background

Since completion of the original assessment in August 2022, the scope of the GEGHA project has been refined. An addendum has been included to this report which outlines the amended project scope and updates the economic impact assessment component of the original report. The updated economic impact assessment only includes the State Significant element of the project, excluding the Solar Farm. The updated scope description and the economic impact assessment are provided at the end of this document (Addendum – Revised Project Scope October 2024).

This report has been undertaken at the request of Hiringa Energy to estimate the economic impacts of the 'Good Earth Green Hydrogen and Ammonia' (GEGHA) project, a new green hydrogen and ammonia facility proposed to be developed west of Moree in northern New South Wales.

The project site consists of the rear section of a vacant parcel within an established industrial precinct to the west of the Ipswich city centre (Figure 1).

The facility is proposed to be located at the Keytah agricultural property; a 65,000-acre sustainable cropping operation owned by the Sundown Pastoral Company. Keytah is one of Australia's largest cotton producing properties and also accommodates the Wathagar cotton gin. Sundown Pastoral Company's cotton brand, 'Good Earth Cotton' is the world's first carbon positive traceable cotton and the one of the most water efficient cottons produced in the world¹.

The GEGHA project is a partnership between Sundown Pastoral Company and Hiringa Energy which will deliver an integrated solar energy to hydrogen and ammonia production facility. The project aims to build on regional strengths in renewable energy, agriculture and transport. Utilising solar energy, the proposed facility would produce ammonia-based fertiliser for use by the local agricultural industry, and hydrogen as a replacement diesel fuel for the heavy freight sector.

Figure 1 GEGHA project site



¹ www.sundownpastoral.com.au

1.2 Facility description

The facility description outlined below is from the original project. An update to the GEGHA project scope for the State Significant element of the project is provided in the addendum at the end of this document (Addendum – Revised Project Scope October 2024).

As outlined above, the GEGHA project will be an integrated facility utilising renewable energy to produce hydrogen and ammonia. Energy will be generated by an on-site solar farm which incorporates 27MW photovoltaic power plant and an 11MWh battery. The design is based on the innovative Kanowna solar farm, also located within the region, which utilises DC technology to maximise output and battery storage.

Ammonia and hydrogen will be produced by a 12MW small-scale electrolysis plant. The hydrogen plant also incorporates a range of incidental plant and equipment for storage and safety.

Site layout for the facility and positioning relative to the Wathagar gin is illustrated in Figure 2 below.

The key elements of the project can be further summarised as:

- Large-scale solar PV as the dominant energy source
- Battery storage of energy, allowing for smoothing of production operations and better utilisation of hydrogen and ammonia production plant
- A grid connection to allow for both supplemental renewable energy imports (e.g. overnight wind energy via PPA, winter solar PV via PPA) and the export of peak solar production when it cannot be utilised on-site.
- 12MW hydrogen electrolysis, allowing for material production of green hydrogen
- 10 tonne per day ammonia plant, to convert green hydrogen feedstock into green ammonia
- Associated hydrogen and ammonia storage, to buffer the overall process against seasonal ammonia demand and renewable energy variability.

Figure 2 Facility plan overview



Source: Hiringa Energy

1.3 Purpose and scope

The purpose of this report is to provide an overview of the regional economy and to undertake economic impact assessment (EIA) to estimate the economic impacts of the GEGHA project on the regional and State economies. Economic impacts include changes in direct and supply chain activity associated with the short-term construction and ongoing operation of the new facility.

Supplementary analysis is also provided on the broader market opportunity within New South Wales for small-scale hydrogen and ammonia production for regional market requirements. The broader market opportunity is demonstrated through analysis of two specific opportunities that have been the subject of preliminary investigations.

Economic impact analysis in this report has been undertaken using REMPLAN – *regional economic modelling and analysis system*².

All direct expenditure, revenue and employment assumptions outlined in the report are based on data that has been supplied to REMPLAN by the Hiringa Energy.

This assessment applies REMPLAN economic data for the defined regions of Upper North West functional economic region, and the State of New South Wales incorporating data sourced from the ABS 2016 Census (Place of Work), 2018 / 2019 ABS National Input / Output Tables, and ABS Gross State Product (June 2021).

Economic impacts are reported in terms of:

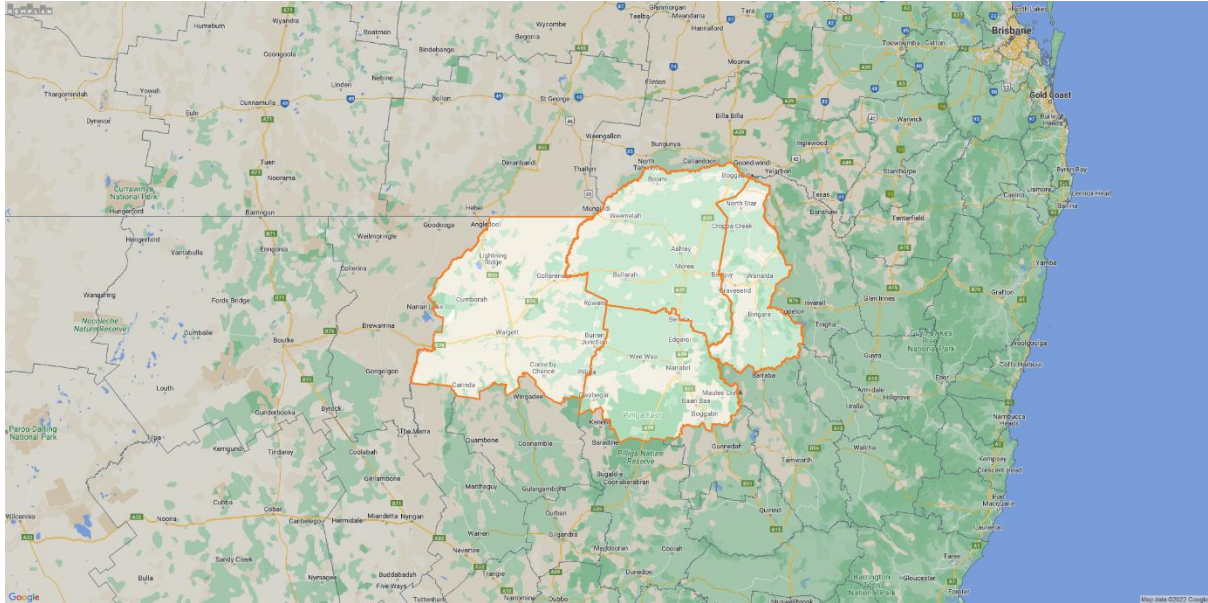
- Output / Revenue (\$M)
- Value-added (\$M)
- Employment (Jobs).

² www.rempln.com.au

1.4 Region of analysis

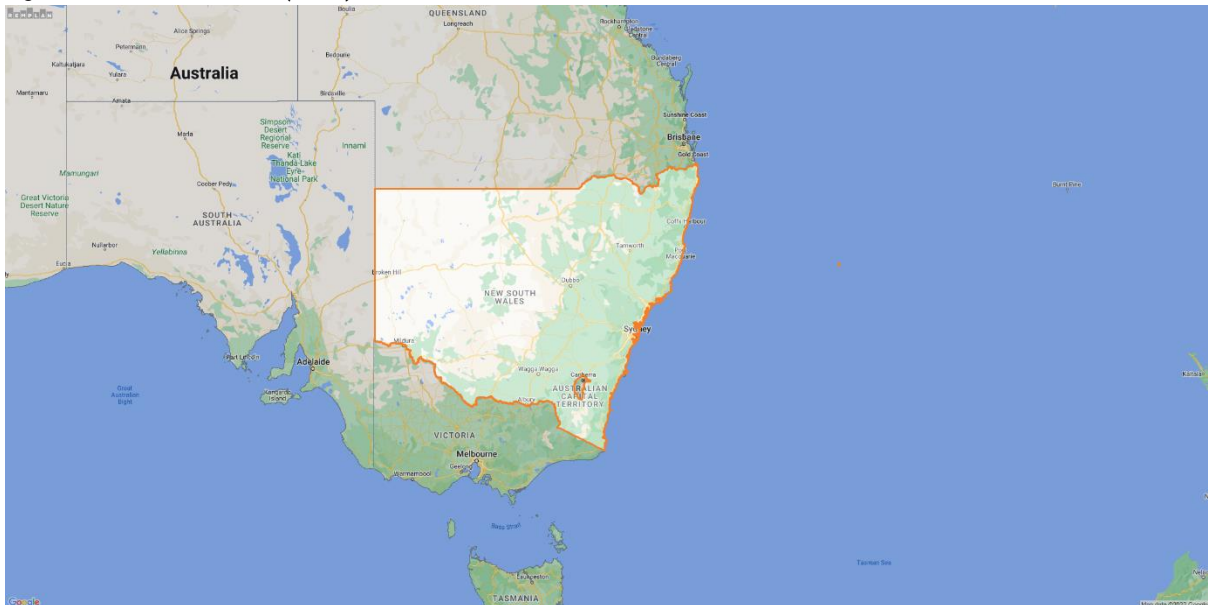
Analysis in this report has been undertaken in the context of the Upper North West functional economic region (FER region)³, and New South Wales (State).

Figure 3 Upper North West functional economic region



Source: <https://remplan.co/3vVSFaA>

Figure 4 New South Wales (State)



Source: <https://remplan.co/3JIXRo1>

³ The FER Upper North West region comprises the local government areas of: Gwydir, Moree Plains, Narrabri, and Walgett.

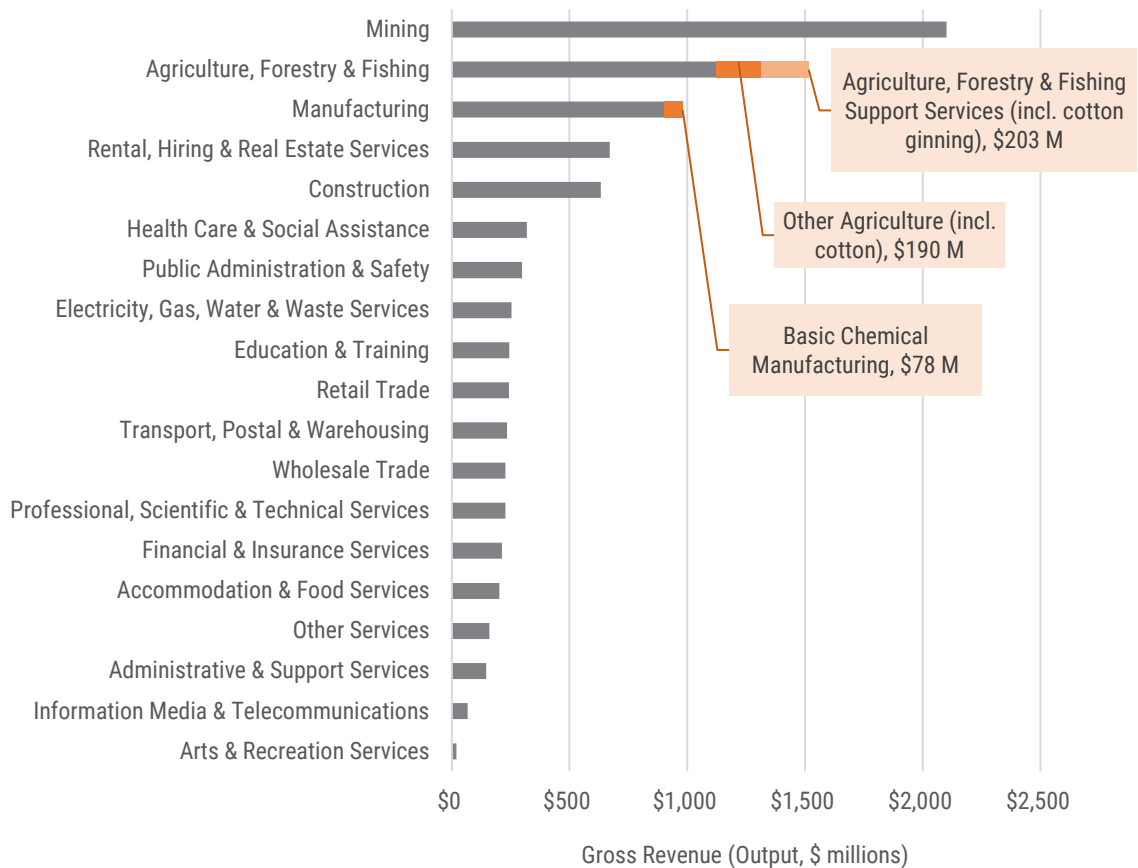
2 FER Region economic profile

2.1 Industry Capability

The FER Region generates an estimated \$8.8 billion in gross revenue (i.e. output) annually, primarily being driven by economic activity within mining, agriculture and manufacturing. Agriculture generates \$1.5 billion in gross revenue with the sub-sector of other agriculture (which includes cotton) generating an estimated \$190 million. The sub-sector which includes cotton ginning and other agricultural support services generates \$203 million.

The region's manufacturing sector is dominated by meat product manufacturing. However, as illustrated in Figure 5, the manufacture of basic chemicals (inclusive of industrial gas and fertilisers) is well represented in the region.

Figure 5 Gross Revenue generated in FER region



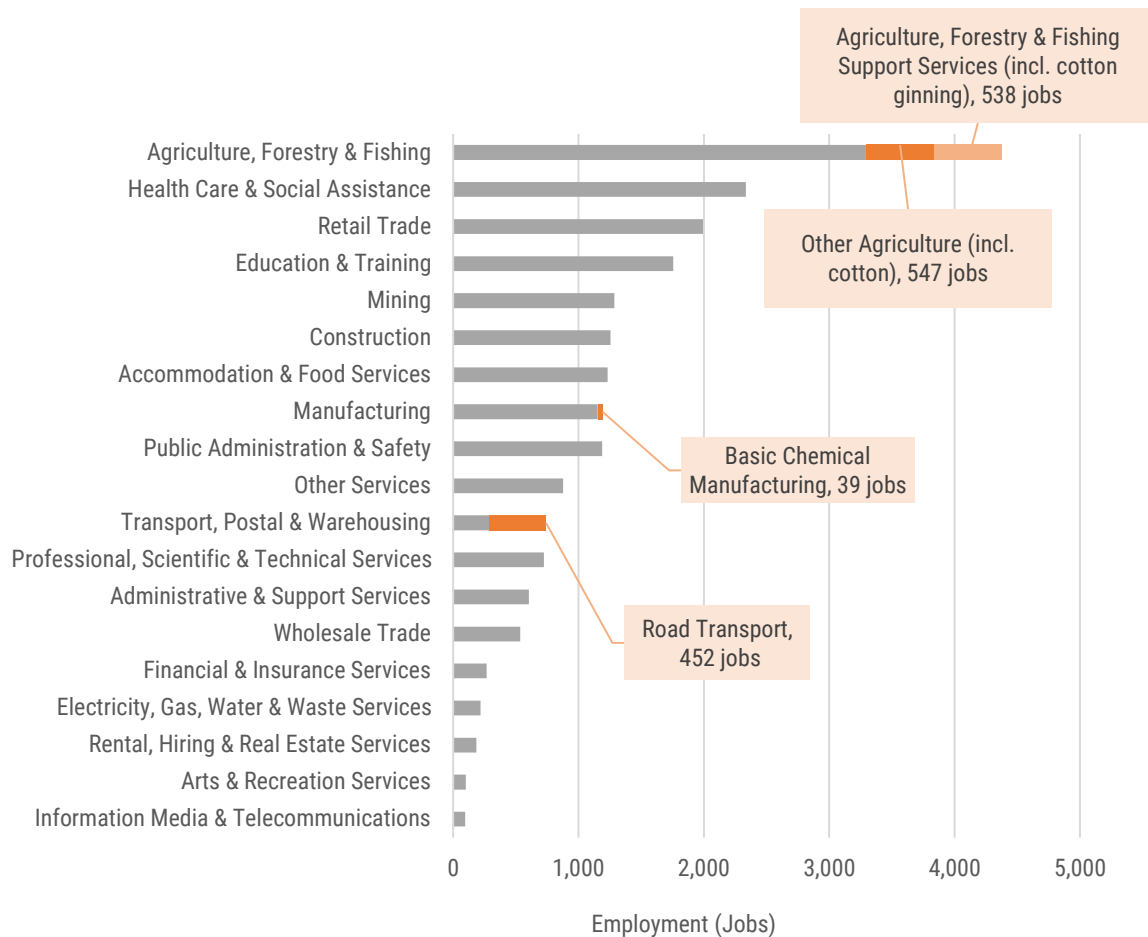
The workforce of the FER region totals 21,000, primarily within agriculture and population servicing industries such as health, retail and education.

One in five (20.9%) of the region's workforce work within agriculture, a far higher proportion than NSW at 2.3%. Of the 4,400 local agricultural workers, 547 are employed in the sub-sector 'Other Agriculture' which includes fruit and cotton production, and a further 538 in support services (which includes cotton ginning).

Road transport⁴ supports 450 jobs in the region accounting for 2.2% of the workforce (similar to the rate for NSW at 2.0%).

A small number of workers (39 or 0.2% of total workforce) work within the basic chemical manufacturing sector. This is the workforce that would potentially service the operational requirements of the GEGHA facility.

Figure 6 Employment supported in FER region



Industry specialisation

The Location Quotient (LQ) reported below in Table 1 reflect the region's employment concentration, or specialisation, within particular industries. The data shows the FER region's workforce is highly specialised in a range of industries associated with agriculture and mining (directly or through support of supply chain activities). Of particular relevance to the proposed project is the region's existing specialisation in crops such as wheat and cotton.

Cotton ginning is classified as an agricultural support service and has an LQ of 13.0. Therefore workers in the region are 13 times more specialised in provision of agricultural services compared to the state-wide workforce.

⁴ Includes road freight transport, taxi and other road transport.

The cotton growing sector sits within the other agriculture industry classification which has an LQ of 5.2, this is reflective of the other agriculture industry being five times more concentrated in the FER region, compared to the State.

Notably, the basic chemical manufacturing industry is fairly specialised in the region with an LQ of 2.0. Amongst other sub-sectors, this industry classification includes both hydrogen and fertiliser manufacture. Currently, the majority of employment in this sector is associated with the manufacture of fertiliser and insecticides to support agricultural production⁵.

Table 1 Industry specialisation, FER region compared to New South Wales

	Location Quotient ^a
Agriculture, Forestry & Fishing Support Services	13.0
Sheep, Grains, Beef & Dairy Cattle^b	11.8
Coal Mining	9.0
Meat & Meat Product Manufacturing	6.2
Other Agriculture^c	5.2
Exploration & Mining Support Services	4.0
Non Metallic Mineral Mining	2.0
Basic Chemical Manufacturing^d	2.0
Aircraft Manufacturing	2.0
Other Repair & Maintenance	1.7
Automotive Repair & Maintenance	1.6

Notes: a) employment LQ of greater than 1.5. b) includes wheat growing. c) includes cotton growing. d) includes the manufacture of industrial gas and fertiliser.

Source: Based on REMPLAN Economy.

⁵ 2016 Census, Place of Work Data.

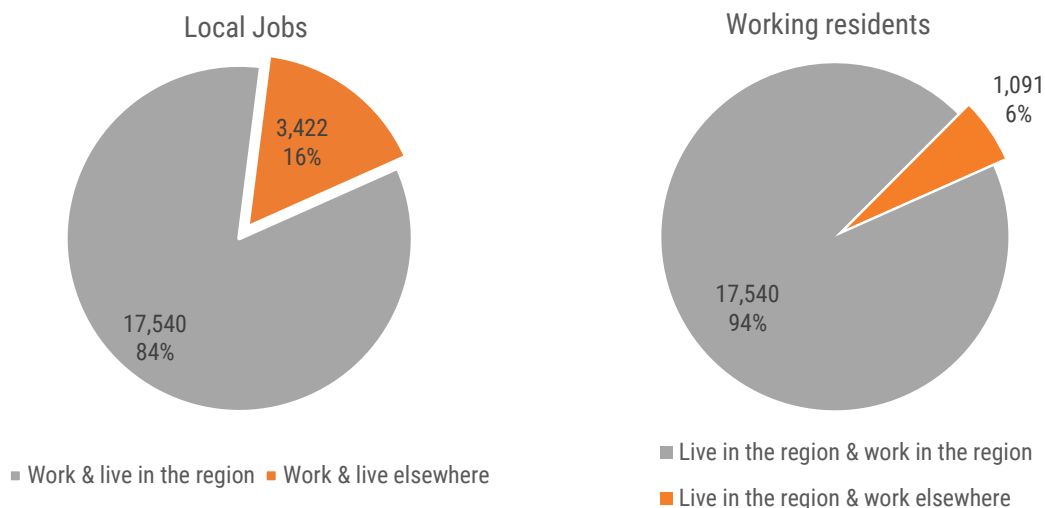
2.2 Workforce Capability

The workforce of the FER region totals 20,963, the majority of those workers live in the region (17,540 or 84%). A further 3,422 local workers reside elsewhere, primarily in Gunnedah, Armidale and Goondiwindi. These non-resident workers are fulfilling roles across a range of local industries, the majority working in mining (941 workers), agriculture (533), health care (290) and construction (281).

A region's employment 'self-containment' refers to the rate that local industries employ local residents. The number of employed residents is estimated to be 18,631, 94% of whom (or 17,540) work locally, this reflects a high rate of self-containment. In other words, working residents are largely able to find employment within their local community. The implications of this include locally captured expenditure, improved environmental outcomes through reduced commuting, and social benefits such as retaining connection to community.

The small proportion of employed residents commuting elsewhere for work (1,091, 6%) are largely working in agriculture and construction as trade workers and labourers.

Figure 7 Workforce and working residents, FER region



The high rate of self-containment is reflected in labour market statistics, such as the unemployment rate, which is generally higher than the state sitting at around 7.5% compared to 5.5%. However, local unemployment has steadily fallen since 2015 to reach 5.6% in 2021 compared to 5.0% for NSW.

A falling unemployment rate can often be linked to persons leaving the labour force and are therefore not considered to be looking for work nor 'unemployed'. However, this is not the case for the FER region, as demonstrated in the figure below, the participation rate increased over the past decade from around 75% in 2013 to 81% in 2021.

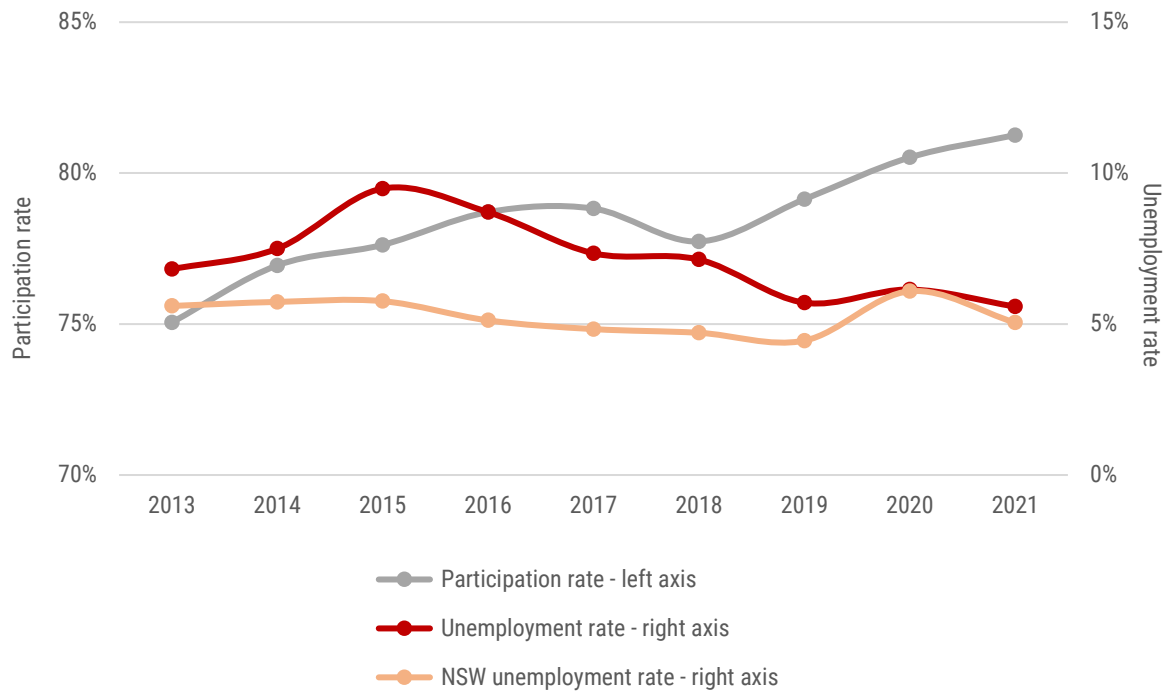
The current labour market in the FER region is similar to many regional areas in Australia in terms of being a relatively tight labour market reflected in rising labour force participation, falling unemployment and falling resident population.

Once operational the GEGHA facility will support local employment through the provision of local jobs, further diversification of local industry and opportunity to work in a highly innovative and sustainable

business. The facility will require an on-site operational workforce of around seven persons and the integration with the agricultural operation to require an additional two employees for Sundown.

The new facility operations and workforce requirements are at a scale that will complement existing FER regional workforce capabilities without placing excessive demand on an already tight labour market.

Figure 8 Labour force participation and unemployment rate, FER region



Source: Based on National Skills Commission, Small Area Labour Markets (SALM), Australian Bureau of Statistics Census and Australian Bureau of Statistics, Regional population.

2.3 Import Replacement Opportunities

Understanding where there are gaps in the supply chains provides the opportunity to potentially support import replacement with local production (and jobs), providing the opportunity to recapture escaped expenditure.

The figure below presents a breakdown of expenditure by industry within the FER region. The breakdown highlights the level of expenditure on goods and services likely to be captured within the region, imported from the rest of Australia and imported from overseas based on the structure of the local economy.

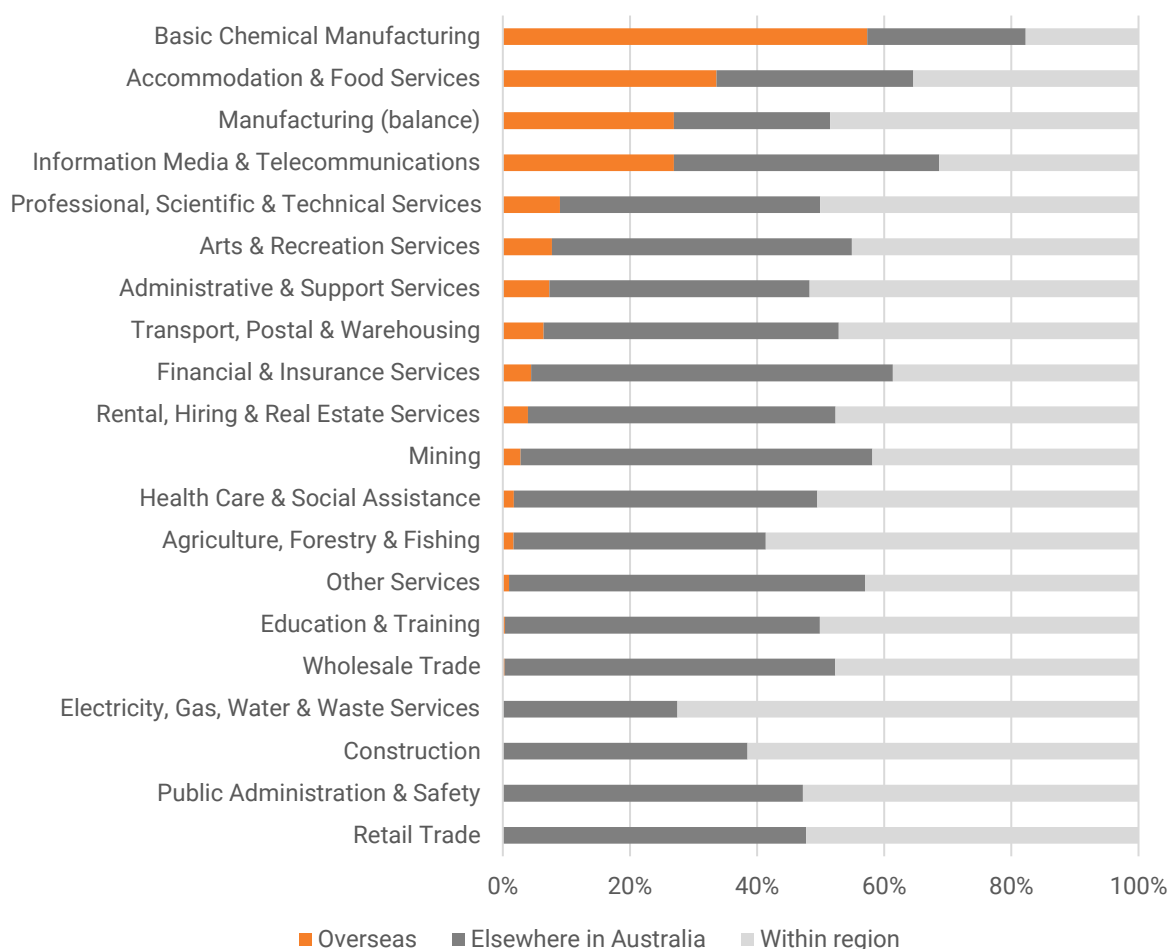
The industry classification of basic chemical manufacturing includes a range of sub-sectors⁶ including those relevant to the proposed project, namely industrial gas and fertiliser manufacture. This industry classification has been adopted to reflect operations of the proposed project.

On average in the Fer region 8% of an industry's expenditure on intermediate goods and services is spent on overseas imports. As illustrated in Figure 9 the manufacture of basic chemical products is heavily reliant on overseas imports accounting for over half (57%) of total expenditure for that industry, the highest proportion across all industry in the FER region.

Generally, goods and services imported from overseas are priced at a level making substitution with local supply unlikely and in instances, unfeasible. However, the GEGHA facility directly addresses this local need for imported product through utilising renewable energy to produce hydrogen and ammonia-based fertiliser for use by the local agriculture enterprises.

⁶ Includes the manufacture of Industrial Gas, Basic Organic Chemical, Basic Inorganic Chemical, Synthetic Resin and Synthetic Rubber, Other Basic Polymer, Fertiliser, Pesticide, Photographic Chemical Product, Explosive, Other Basic Chemical Product.

Figure 9 Industry Expenditure Breakdown, FER region

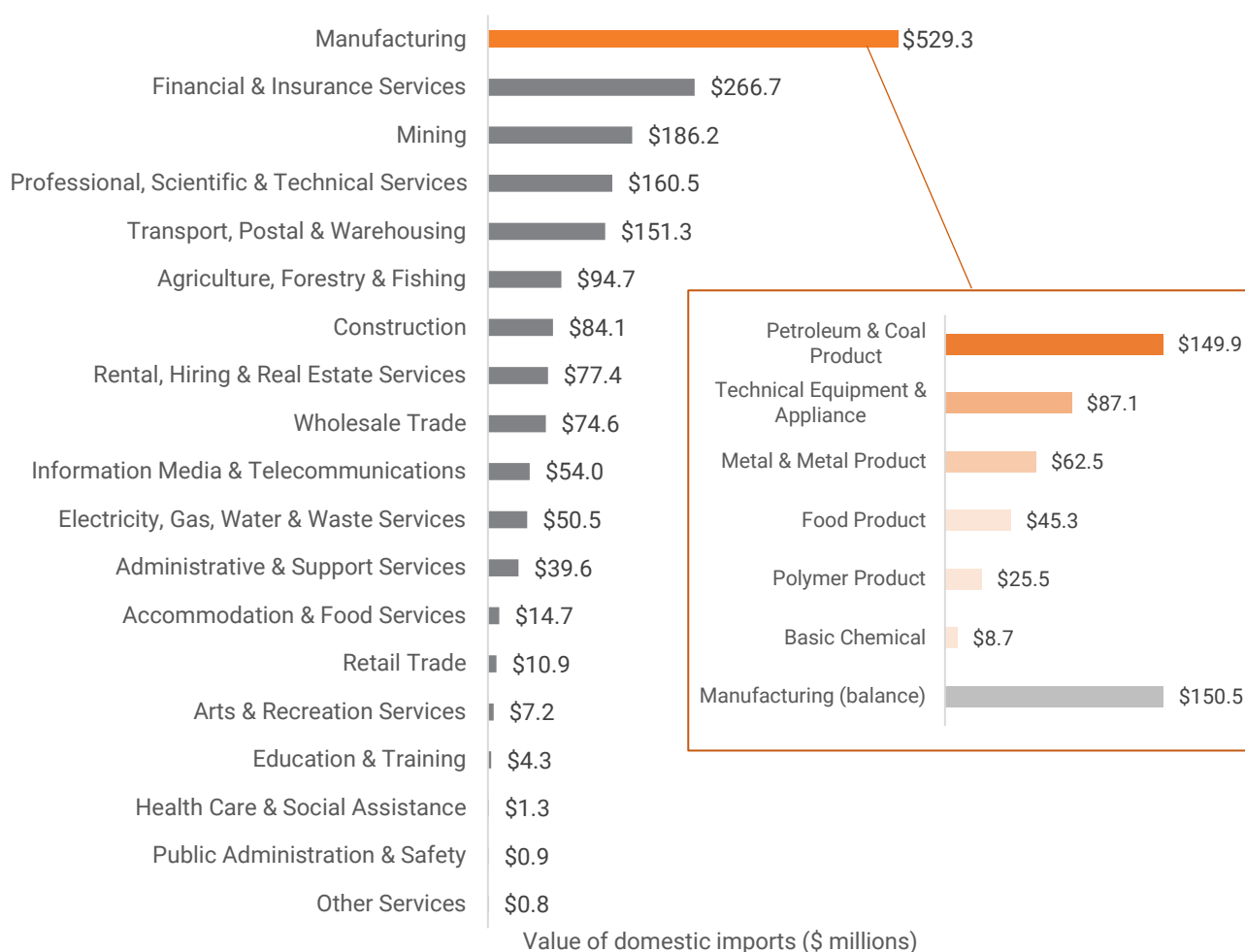


Source: REMPLAN Economy

Domestic imports may indicate opportunities for import replacement, increased value-adding and supply chain development in the local area. Local business and industry are importing \$1.8 billion of goods and services from the rest of Australia (i.e. outside of the region) as inputs into the production process. The highest demand for external supply is coming from mining, agriculture, manufacturing and construction with a combined total of \$1.2 billion (64% of total domestic imports).

The value of domestic imports from external industries is presented in Figure 10, the highest value coming from manufacturing (\$529.3 million, 29% of total domestic imports). A further breakdown of external manufacturing sectors highlights the regions reliance on petroleum products (\$149.9 million being imported). Basic chemical manufactured products are amongst the highest value of imported products at \$8.7 million.

Figure 10 External supply being imported by local industry



Local demand for petroleum and coal manufactured product is outlined in Table 2, amongst the sectors importing the highest value are agriculture (including cotton and wheat growing) and road transport. This supply chain gap again highlights the potential benefit in capturing this escaped expenditure locally through project such as the GEGHA Facility which will service the heavy freight sector by through the production of hydrogen as a replacement diesel fuel.

Table 2 FER region sub-sectors importing petroleum product from rest of Australia

	\$ millions	Share of total imports
Coal Mining	\$71.4	47.6%
Sheep, Grains, Beef & Dairy Cattle^a	\$34.9	23.3%
Road Transport	\$10.4	6.9%
Other Agriculture^b	\$6.9	4.6%
Construction Services	\$3.5	2.3%
Sub-total	\$127.1	84.8%
Other	\$22.8	15.2%
TOTAL	\$149.9	100.0%

Notes: a) includes wheat growing. b) includes cotton growing.

Local industry imports \$8.7 million in goods and services from basic chemical manufacturing in the rest of Australia. A breakdown of demand by local industry is presented in the table below and clearly indicates strong demand from the agricultural industry. This basic chemical manufacturing industry classification (as discussed earlier) includes a range of industrial products including industrial gas, pesticide and fertiliser. It can be assumed the majority of demand from agriculture will be for pesticides and fertilisers, a proportion of which will demand for ammonia related products manufactured elsewhere and transported into the region to support agricultural activities.

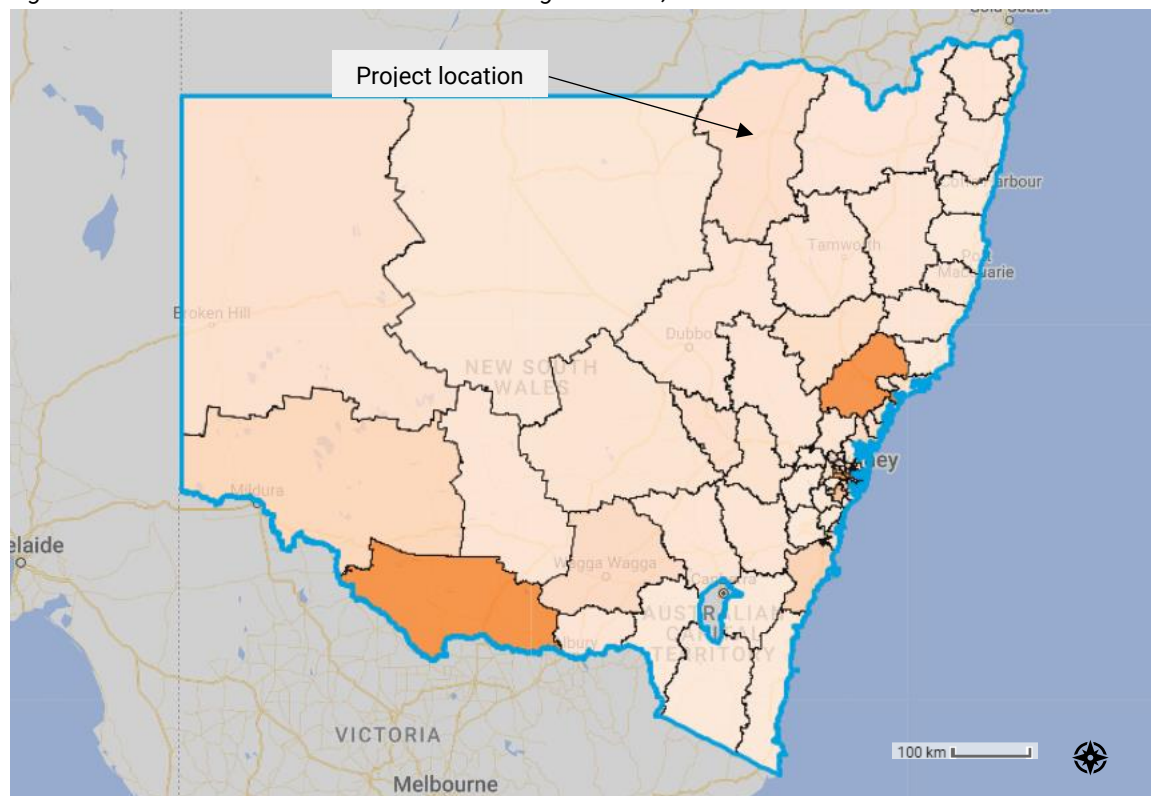
Table 3 Upper North West sub-sectors importing basic chemical product from rest of Australia

	\$ millions	Share of total imports
Sheep, Grains, Beef & Dairy Cattle^a	\$3.6	41.4%
Coal Mining	\$1.4	15.9%
Agriculture, Forestry & Fishing Support Services	\$0.6	7.4%
Other Agriculture^b	\$0.6	7.2%
Construction Services	\$0.6	6.9%
Sub-total	\$6.8	78.8%
Other	\$1.8	21.2%
TOTAL	\$8.7	100.0%

Notes: a) includes wheat growing. b) includes cotton growing.

Figure 11 presents the location⁷ of basic chemical manufacturing in NSW with concentrations in the Hunter, Ryde, Botany Bay and in the Upper Murray. The figure clearly shows the absence of basic chemical manufacturing in areas surrounding the project region, given the density of cropping activity, this reiterates a local supply chain gap that can be fulfilled through localised production.

Figure 11 Location of basic chemical manufacturing industries, New South Wales



⁷ Location by Statistical Area 3

3 Economic Impact Assessment

An update to the data presented in this section is provided in the addendum at the end of this document (Addendum – Revised Project Scope October 2024).

3.1 Reporting elements of the EIA

Output

Output data represents the gross revenue generated by businesses/organisations in each of the industry sectors in a defined region. Gross revenue is also referred to as total sales or total income. As such, estimates of output provide an indication of the level of activity occurring in a region, an industry or organisation.

Output is a high-level economic indicator which is inclusive of other indicators such as wages, intermediate inputs and value-added. Output is an essential measure in understanding the interrelationships between industries in a region and for measuring an individual industry's output. However, for the broader economy, output does include a degree of double counting by including the sales of intermediate products and final products. Output can also be referred to as revenue, or total sales.

Value-added

Value-added is a key economic metric which estimates the marginal economic value-added by an industry. Unlike output, value-added is a non-duplicative indicator as it excludes the costs of intermediate inputs. Therefore, it is one of the best indicators of industries' contribution to the wealth of a region. However, output and value-added are complementary indicators and when considered together, give an indication of the proportional level of value-added by an industry.

Value-added by industry sector is the major element in the calculation of Gross Regional Product / Gross State Product / Gross Domestic Product.

Employment

Employment data represents the number of people employed by businesses and organisations within the defined region. Employment data presented in this report is destination of work data. That is, no inference is made as to where people in a defined region reside unless otherwise stated. Employment figures have been converted to full-time equivalence of 38 hours per week.

3.2 Assumptions

Construction phase

The cost plan provided by Hiringa Energy estimates total development costs for the project of \$101,855,450. Depending on the good or service being procured, some items are available within the FER region, while others will be procured from elsewhere in New South Wales. Some specific items of equipment are being imported from other states in Australia and from overseas.

For modelling, expenditure on items imported from overseas or from other areas of Australia have been excluded as these represent an escape of expenditure from the regions included in this analysis. The construction phase also includes engineering and design elements as well as all insurance and legal services costs which facilitate the project.

Excluding goods and services procured from outside the region, it is estimated that 6% of the project expenditure will be captured within the FER regional economy, and 40% in New South Wales (including the FER region). For a specialised project, this represents a relatively high level of expenditure capture, particularly for the FER region. This is largely due to the nature of the development where local trades and professional services will be utilised for site preparation, engineering and installation of non-specialised equipment.

To undertake the economic impact modelling for the respective regions, each cost item has been assigned to an industry sector and the share of expenditure captured within respective economies has been attributed to the region. A summary of expenditure by industry is outlined in Table 4.

The nature of construction projects means that economic impacts are short term, extending over the period of the construction phase. Information provided by Hiringa Energy indicate a 3-year construction period with commencement in January 2023 and completion in October 2025.

Table 4 Development costs (State analysis includes FER analysis values)

Industry Sector	State analysis	FER analysis
Auxiliary Finance & Insurance Services	\$975,000	\$0
Construction Services	\$8,995,500	\$1,068,000
Electrical Equipment Manufacturing	\$605,000	\$0
Electricity Distribution	\$850,000	\$0
Heavy & Civil Engineering Construction	\$6,140,000	\$1,770,000
Iron & Steel Manufacturing	\$2,250,000	\$360,000
Metal Containers & Other Sheet Metal Product Manufacturing	\$2,710,000	\$0
Non-Residential Building Construction	\$4,575,000	\$1,800,000
Other electrical Equipment Manufacturing	\$0	\$0
Professional, Scientific & Technical Services	\$9,120,000	\$741,000
Prof., Scientific, Computer & Electronic Equipment Manu.	\$440,000	\$0
Public Administration & Regulatory Services	\$550,000	\$550,000
Road Transport	\$22,000	\$0
Specialist & Other Machinery & Equipment Manufacturing	\$2,565,000	\$0
Structural Metal Product Manufacturing	\$880,000	\$0
Transport	\$0	\$0
Wholesale Trade	\$220,000	\$0
Total	\$40,897,500	\$6,289,000

Operational phase

Following completion of the new facility, operations are anticipated to commence at full capacity (i.e. there is no requirement to scale up over a period of several years). Contracts for a considerable portion of the ammonia and hydrogen outputs are already place, with hydrogen and ammonia storage facilities enabling ongoing production through any potential demand seasonality. Other revenue streams related to the production of renewable energy and carbon dioxide abatement will also accrue as production and energy generation commences. Operational phase impacts have been modelled for the first year of operation (2025).

Hiringa Energy provided detailed a financial and operational plan which included estimates of revenue, staffing and wages which were applied in the modelling of operational impacts. Where direct external jobs are being created as part of the project, specifically in the operations of the Wathagar gin, estimates of additional wages and revenue have been derived from REMPLAN's economic model which provides typical productivity of workers across various industries in terms of both revenue and wages.

The financial model provided by Hiringa Energy indicates that the majority of revenue (around 48%) generated by the new facility will be through the production and sale of ammonia, with a further 29% through the production and sale of hydrogen. As this is the primary source of revenue, the operational phase of the facility has been modelled under the 'basic chemical manufacturing' industry sector, which includes industry classes of 'fertiliser manufacturing' and 'industrial gas manufacturing', the latter class incorporating hydrogen manufacturing as a primary activity.

As a cotton ginning facility, activity associated with the Wathagar gin has been modelled in the 'agriculture, forestry & fishing support services' sector which includes the 'cotton ginning' industry class.

In contrast to the short-term impact of construction activity, the operational impact of the facility is ongoing annually. However, any variation in actual economic performance of the facility site will proportionally affect the level of economic impacts.

Table 5 Marginal increase due to operational activity

Industry Sector	State analysis	FER analysis
Basic Chemical Manufacturing		
Revenue (\$)	\$12,027,740	\$12,027,740
Wages and salaries (\$)*	\$1,011,683	\$901,000
FTE employment	7.7	7.0
Agricultural support services		
Revenue (\$) ^	\$924,193	\$924,193
Wages and salaries (\$) ^	\$147,603	\$147,603
FTE employment	2.3	2.3
Total		
Revenue (\$)	\$12,951,933	\$12,951,933
Wages and salaries (\$)	\$1,159,286	\$1,048,603
FTE employment	10.0	9.3

Source: Hiringa Energy and REMPLAN Economy

* State analysis includes estimates of management / admin wages derived from REMPLAN economic model for NSW, based on FTE employment figures provided.

^ Derived from REMPLAN economic model for NSW, based on FTE employment figures provided.

Although not included in this modelling, Sundown Pastoral has indicated that the incorporating inputs from the GEGHA project into their production has the potential to substantially increase prices that they could achieve for their cotton. Directors of Sundown Pastoral have indicated that their cotton brand 'Good Earth' is achieving \$90 per bale in premium due to its current environmental credentials. With the new renewable energy, green ammonia and green hydrogen inputs Sundown Pastoral are aiming to increase this to \$200 per bale.

Based on current production of 75,000 bales per year, this would result in a marginal increase of \$8.25 million in revenue per annum.

Information has not been provided as to whether this increase would require any additional inputs, which would typically generate additional demand in the local economy, or it would be achieved purely due to the green credentials of the brand.

This level of revenue would typically support between 22 FTE jobs directly, and up to 44 FTE jobs through direct and flow-on impacts in New South Wales.

3.3 EIA results

Direct economic impacts are those that result from the initial capital expenditure occurring within the local economy. This increased direct expenditure supports additional levels of economic activity in local supplying sectors, these are reported as supply chain impacts. The additional activity that occurs through direct and supply chain effects supports jobs in the local economy which is coupled with an increase in the total value of wages and salaries paid to employees. A proportion of these wages and salaries are captured within the local economy. These are reported as consumption impacts and typically occur in population serving industries such as retail trade, health care and education.

Results of the EIA for the construction phase and operational phase provided in this section have only been reported for the New South Wales economy. A summary of the results for the FER region is provided in Appendix A.

3.3.1 Construction phase impacts – New South Wales

Output: The direct local expenditure of \$40.90 million within New South Wales on construction and set-up costs will generate an additional demand for intermediate goods and services of \$36.30 million. This represents a Type 1 Output multiplier of 1.89. These supply chain effects include multiple rounds of flow-on effects, as servicing sectors increase their own output and demand for local goods and services in response to the direct change to the economy.

The increases in direct and indirect output would typically correspond to the creation of jobs in the economy. Corresponding to this change in employment would be an increase in the total of wages and salaries paid to employees in the region. A proportion of these wages and salaries are typically spent on consumption and a proportion of this expenditure is captured in the local economy. The consumption effects under this scenario are estimated at \$26.47 million.

Total output, including all direct, supply chain and consumption effects is estimated to increase by up to \$103.67 million over the three-year construction period. This represents a Type 2 Output multiplier of 2.53.

Value-added: From a direct increase in revenue for local businesses \$40.90 million, the corresponding increase in direct value-added in New South Wales is estimated at \$14.28 million. Flow-on supply chain effects in terms of local purchases of goods and services (indirect impacts) would result in a further increase to value-added of \$14.38 million. This represents a Type 1 value-added multiplier of 2.01.

The consumption effects under this scenario are expected to further boost value-added by \$13.45 million. Total value-added, including all direct, supply chain and consumption effects is estimated to increase by up to \$42.11 million. This represents a Type 2 value-added multiplier of 2.95.

Employment: The construction expenditure corresponds to the creation of 81.0 direct FTE jobs. The indirect impacts would result in a further 79.6 jobs. This represents a Type 1 Employment multiplier of 1.98. The consumption effects under this scenario are estimated to further boost employment by 62.7 jobs. Total employment, including all direct, supply chain and consumption effects is estimated to increase by up to 223.3 FTE jobs across the State. This represents a Type 2 Employment multiplier of 2.76.

It is important to note that these are not annual job numbers, but the number that would be supported across the three-year construction period. In years where expenditure is higher, this would typically

translate to a greater number of jobs being supported in that year. For example, the level of activity may support 50 jobs in the first year, 100 jobs in the second year, and 73 jobs in the third year.

Construction phase summary

Total economic impacts in New South Wales over the construction phase, including all direct and indirect economic effects, are anticipated to support up to:

- \$103.67 million in increased output/revenue for local business
- \$42.11 million in value-added
- 223 jobs in the State's economy over three years.

The Type 2 output multiplier for the construction phase is 2.53. That is, for every dollar spent on goods and services from businesses within the State, a further \$1.53 is captured within the New South Wales economy.

For employment, the Type 2 multiplier is slightly higher at 2.76. That is, for every direct FTE job supported through the construction phase, another 1.8 FTE jobs are supported within the local economy.

Figure 12 Construction Phase Impacts –New South Wales

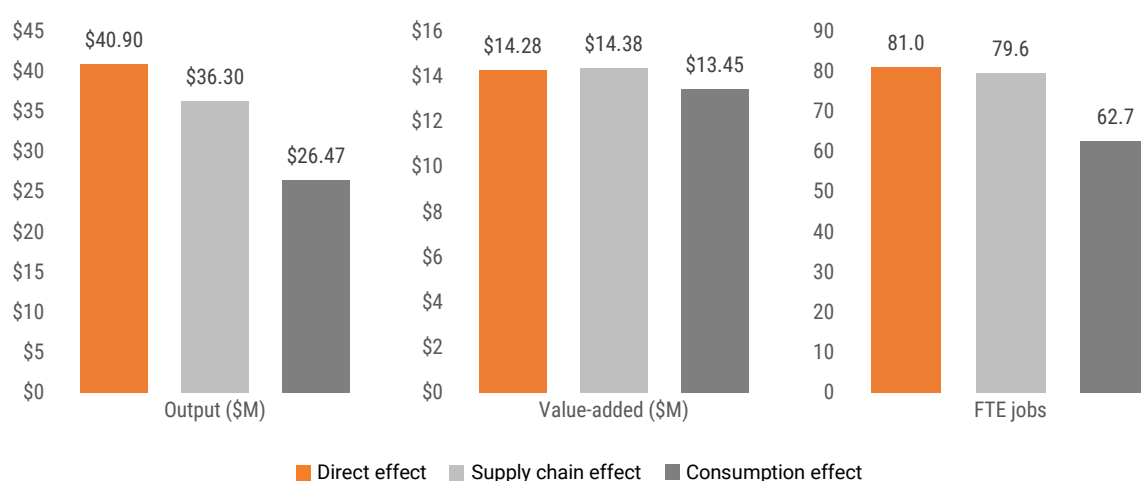


Table 6 Construction Phase Summary – New South Wales

Impact Summary	Direct Effect	Industrial Effect	Consumption Effect	Total Effect	Type 2 Multiplier
Output (\$M)	\$40.90	\$36.30	\$26.47	\$103.67	2.53
Value-Added (\$M)	\$14.28	\$14.38	\$13.45	\$42.11	2.95
Employment (FTE Jobs)	81.0	79.6	62.7	223.3	2.76

3.3.2 Operational Phase Impacts – New South Wales

All economic impacts refer to the annual impact of the operations of the proposed facility.

Output: From a direct increase in annual output of \$12.95 million it is estimated that the demand for intermediate goods and services in New South Wales would increase by \$5.86 million (Type 1 Output multiplier of 1.45). These annual supply chain effects include multiple rounds of flow-on effects.

The increases in output typically correspond to the creation of additional jobs and payment of wages and salaries in the region. A proportion of these wages are typically spent on consumption and a proportion of this expenditure is captured in the New South Wales economy. The consumption effects under this scenario are estimated at \$3.69 million. Total output, including all direct, supply chain and consumption effects is estimated to increase by up to \$22.50 million per annum. This represents a Type 2 Output multiplier of 1.74.

Value-added: From a direct increase in annual output of \$12.95 million, the corresponding increase in direct value-added in New South Wales is estimated at \$2.02 million. Flow-on supply chain effects in terms of local purchases of goods and services (indirect impacts) would result in a further increase to value-added of \$2.33 million. This represents a Type 1 Value-added multiplier of 2.15.

The consumption effects under this scenario are expected to further boost value-added by \$1.88 million. Total value-added, including all direct, supply chain and consumption effects is estimated to increase by up to \$6.23 million per annum. This represents a Type 2 Value-added multiplier of 3.08.

Employment: The operations will support 7 direct jobs on site, 2.3 jobs at Sundown Pastoral and 0.7 jobs in management and admin roles at Hiringa Energy. A total of 10.0 direct jobs will be supported in New South Wales, with the indirect impacts resulting in a further 11.7 jobs. This represents a Type 1 Employment multiplier of 2.17. The consumption effects under this scenario are estimated to further boost employment by 8.7 jobs. Total employment, including all direct, supply chain and consumption effects is estimated to increase by up to 30.5 jobs. This represents a Type 2 Employment multiplier of 3.05.

Operational phase summary

Total annual operational economic impacts from 2025, including all direct and indirect economic impacts, in New South Wales is anticipated to support up to:

- \$22.50 million per year in revenue for local businesses and organisations each year
- \$6.23 million per annum in value-added
- 30.5 FTE jobs within the State's economy.

The Type 2 multiplier for employment during the operation phase is relatively high at 3.05. That is, for every new ongoing job created through operation of the facility around 2.05 jobs are supported throughout the New South Wales economy. This high multiplying effect is largely a result of the productive nature of the facility which is able to generate relatively high revenue from a smaller number of on-site employees.

Figure 13 Operational Phase Impacts, 2025 – New South Wales

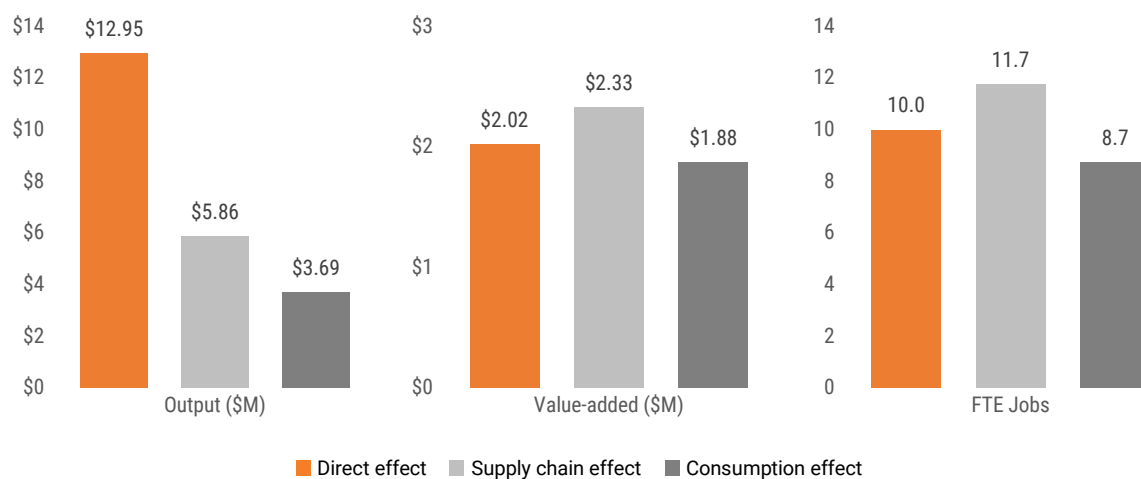


Table 7 Summary of Annual Operation Phase Impacts – New South Wales

Impact Summary	Direct Effect	Supply chain Effect	Consumption Effect	Total Effect	Type 2 Multiplier
Output (\$M)	\$12.95	\$5.86	\$3.69	\$22.50	1.74
Value-Added (\$M)	\$2.02	\$2.33	\$1.88	\$6.23	3.08
Employment (FTE Jobs)	10.0	11.7	8.7	30.5	3.05

4 Market opportunities

Hiringa Energy has carefully considered the agricultural markets and geographies where there is scope to improve the sustainability of food and fibre production whilst developing a commercially viable business model.

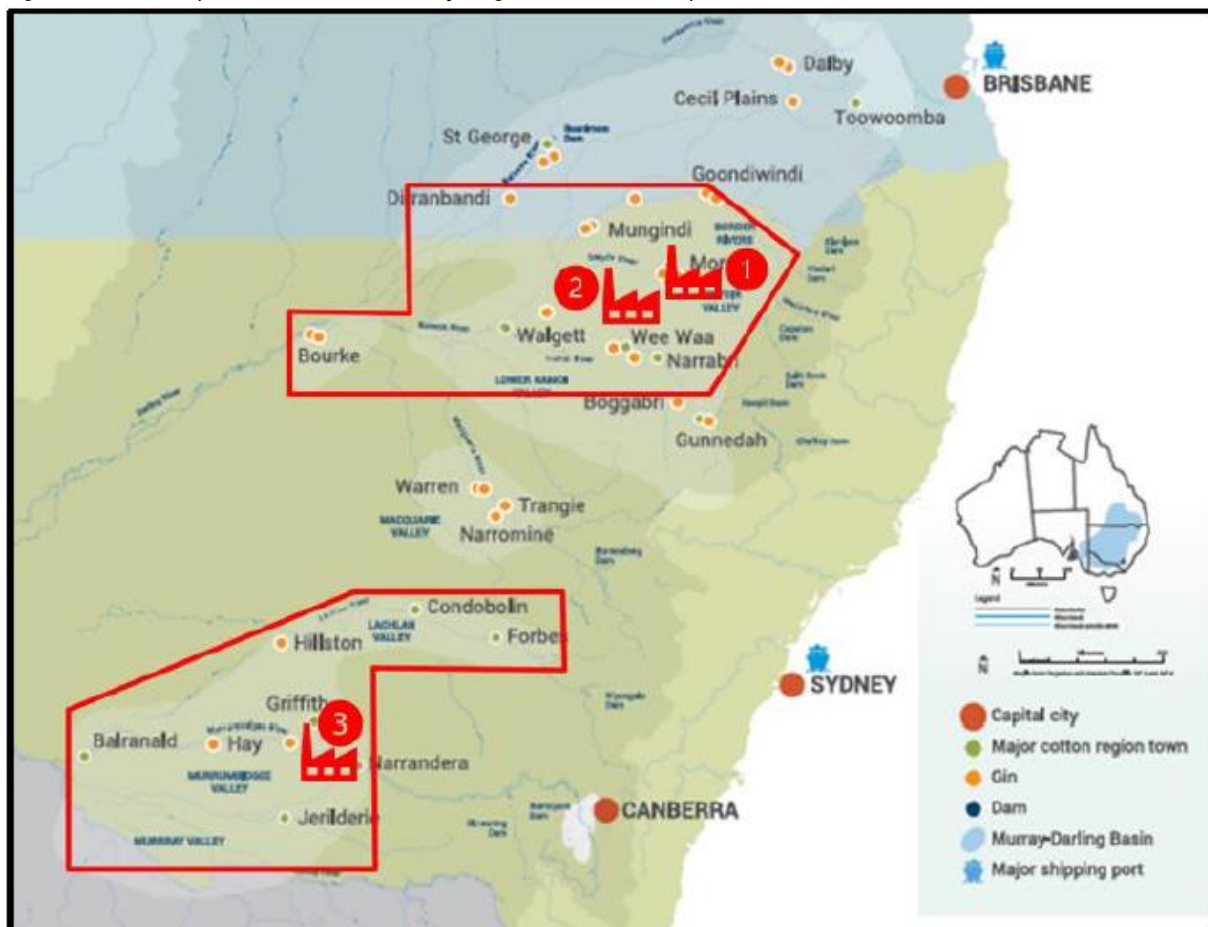
An expansion plan report prepared by Hiringa Energy has considered a range of factors to identify two locations with high potential for initial expansion of the GEGHA model. Key factors under consideration included:

- target crops- cotton being the preferred crop due to its current use of ammonia fertiliser
- geography- within key cotton growing regions, but distant from major fertiliser producers, primarily located along coastal areas, and within identified renewable energy zones.

The two locations identified as the next market opportunities are in northern and southern New South Wales (Figure 14). The northern New South Wales region includes two plants, one being the current GEGHA project which produces 10 tonnes/day of ammonia, and an additional larger plant producing 60 tonnes/day.

The southern region would be serviced by a facility producing 60 tonnes/day. The total production of these three small-scale facilities would equate to 130 tonnes/day of locally produced ammonia fertiliser. Modelling the GEGHA project, these facilities would also produce hydrogen for the local heavy freight sector, and additional revenue through renewable energy generation and CO₂ abatement.

Figure 14 Visual representation of Green Hydrogen and Ammonia plant locations



Source: Hiringa Energy

4.1 Economic Benefits and Job Creation

The preceding economic impact assessment applies direct revenue estimates of the GEGHA project to the expansion plans of the two additional facilities. Revenue is only related to the facility and does not include any other external revenue generators.

Based on the financial model provided by Hiringa the 10 tonne/day GEGHA facility is anticipated to generate around \$12 million in annual revenue. Applying a simple calculation of revenue to facility capacity, an estimated value for revenue per tonne of facility capacity can be derived (Table 8).

Table 8 Estimated revenue per tonne of ammonia facility capacity

Item	Value
GEGHA facility size	10 tonnes / day
Total annual revenue (\$M)	\$12,027,740
Annual revenue per tonne of facility capacity	\$1,202,774

The figure of \$1,202,774 has been applied in the economic impact modelling for the expanded capacity of the three facilities. With total capacity of 130 tonnes/day, this would equate to total annual revenue of \$156.36 million.

This level of revenue would support substantial levels of employment in the State's economy. The direct increase in revenue of \$156.36 million would support an estimated 81.4 FTE job and generate \$21.92 million in value-added.

Considering the direct, supply chain and consumption effects, the impact of the three facilities is greater again. Notably the multiplying effect on value-added and employment are both over 3. For every dollar of direct value added generated by the facilities, an estimated \$2.12 would result in the State's economy contributing to Gross State Product. For every direct job within these facilities, an additional 2.7 FTE jobs would be supported throughout the State's economy (Table 9).

Table 9 Summary of Annual Operation Phase Impacts – New South Wales

Impact Summary	Direct Effect	Supply chain Effect	Consumption Effect	Total Effect	Type 2 Multiplier
Output (\$M)	\$156.36	\$64.90	\$41.30	\$262.56	1.68
Value-Added (\$M)	\$21.92	\$25.49	\$20.99	\$68.40	3.12
Employment (FTE Jobs)	81.4	126.8	97.8	306.0	3.76

Appendix A – EIA Summaries

Construction phase

FER region (map)	Direct Effect	Supply chain Flow-on Effect	Consumption Flow-on Effect	Total	Type 2 Multiplier
Output (\$M)	\$6.29	\$3.57	\$1.50	\$11.36	1.81
Value-Added (\$M)	\$2.24	\$1.37	\$0.88	\$4.49	2.01
Employment (Jobs)	12.4	8.6	3.9	25.0	2.00

New South Wales (map)	Direct Effect	Supply chain Flow-on Effect	Consumption Flow-on Effect	Total	Type 2 Multiplier
Output (\$M)	\$40.90	\$36.30	\$26.47	\$103.67	2.53
Value-Added (\$M)	\$14.28	\$14.38	\$13.45	\$42.11	2.95
Employment (Jobs)	81.0	79.6	62.7	223.3	2.76

Operational phase – 2025 onwards

FER region (map)	Direct Effect	Supply chain Flow-on Effect	Consumption Flow-on Effect	Total	Type 2 Multiplier
Output (\$M)	\$12.95	\$2.95	\$1.22	\$17.12	1.32
Value-Added (\$M)	\$1.91	\$1.18	\$0.71	\$3.81	1.99
Employment (FTE Jobs)	9.3	6.5	3.2	19.0	2.04

New South Wales (map)	Direct Effect	Supply chain Flow-on Effect	Consumption Flow-on Effect	Total	Type 2 Multiplier
Output (\$M)	\$12.95	\$5.86	\$3.69	\$22.50	1.74
Value-Added (\$M)	\$2.02	\$2.33	\$1.88	\$6.23	3.08
Employment (FTE Jobs)	10.0	11.7	8.7	30.5	3.05

5 Addendum – Revised Project Scope October 2024

5.1 Facility description

The Good Earth Green Hydrogen and Ammonia ('GEGHA') Project is an integrated solar energy to hydrogen and ammonia plant that will be constructed at the Wathagar cotton gin in northern NSW, approximately 33km southwest of Moree.

The GEGHA Project's primary objective is to safely construct and operate a green hydrogen and ammonia plant that is capable of delivering an annual production of up to 2,200 tonnes of hydrogen and up to 4500 tonnes of Ammonia to local and regional offtakers.

The project will involve the construction and operation of a new 27MW (DC) solar farm that will provide the power source for the electrolysis plant, ammonia plant, hydrogen storage, ammonia storage and ancillary infrastructure and connections.

The majority of hydrogen will be used on site to produce low-carbon fertiliser (anhydrous ammonia). There will also be a quantity of hydrogen available for use in on-farm fuel conversion and displacement of high-carbon fuels and feedstock in industrial manufacturing and heavy vehicle transport refuelling.

The key elements of the GEGHA project have been revised to include the construction and operation of:

- 15 MW of hydrogen electrolysis utilising high pressure alkaline electrolyzers:
 - Nominally 6 tonnes per day
 - Nominal 2,200 tonnes per year
- 16 tonne per day ammonia (NH₃) plant, to convert green hydrogen and atmospheric nitrogen feedstock into green ammonia.
- Production limited to nominally 4,500 Tonnes per year (based on energy availability).
- Up to 3 tonnes of Hydrogen storage to balance production and demand.
- Up to 600 tonnes of ambient temperature ammonia storage capacity to buffer against seasonal ammonia demand and renewable energy variability.
- Approximately 51 ML of water per year.
- Evaporation pond with a capacity of 16,200 KL.
- Ancillary power and water pump/ connections, water treatment, telemetry, security camera system, switch room and control room.
- Protective perimeter fencing.
- Custody transfer metering for both hydrogen and ammonia.
- Ammonia and Hydrogen Load out facilities adjacent to storage vessels.
- Car park and site office.

Project location is provided in Figure 15 and an updated facility site plan is provided in Figure 16.

Figure 15 Updated GEGHA project site



Source: Hiringa Energy

5.2 Economic Impact Assessment

Construction phase

This part of the addendum assesses the economic impact of the State Significant portion of the project which excludes the Wathagar Stage 1 Solar and Wathagar Stage 2 Solar farms. The updated cost plan provided by Hiringa Energy estimates total development costs for the project of \$68,833,350. Depending on the good or service being procured, some items are available within the FER region, while others will be procured from elsewhere in New South Wales. Some specific items of equipment are being imported from other states in Australia and from overseas.

For modelling, expenditure on items imported from overseas or from other areas of Australia have been excluded as these represent an escape of expenditure from the regions included in this analysis. The construction phase also includes engineering and design elements as well as all insurance and legal services costs which facilitate the project.

Excluding goods and services procured from outside the region, it is estimated that 8% of the project expenditure will be captured within the FER regional economy, and 41% in New South Wales (including the FER region). For a specialised project, this represents a relatively high level of expenditure capture, particularly for the FER region. This is largely due to the nature of the development where local trades and professional services will be utilised for site preparation, engineering and installation of non-specialised equipment.

To undertake the economic impact modelling for the respective regions, each cost item has been assigned to an industry sector and the share of expenditure captured within respective economies has been attributed to the region. A summary of expenditure by industry is outlined in Table 10.

The nature of construction projects means that economic impacts are short term, extending over the period of the construction phase. The economic impact of the construction phase of the project includes both the preliminary engineering, design and approval stage as well as the physical on-site works.

The total construction phase modelled as part of this assessment is expected to span approximately two years (21 months). On-site construction works will commence in Q2/Q3 of 2025 and are anticipated to extend for approximately 40 weeks plus commissioning.

Table 10 Development costs (State analysis includes FER analysis values)

Industry Sector	State analysis	FER analysis
Accommodation & Food Services	\$38,400	\$0
Auxiliary Finance & Insurance Services	\$1,669,000	\$0
Construction Services	\$2,798,320	\$1,091,280
Electrical Equipment Manufacturing	\$192,500	\$82,500
Heavy & Civil Engineering Construction	\$594,720	\$1,223,280
Iron & Steel Manufacturing	\$1,785,400	\$855,000
Metal Containers & Other Sheet Metal Product Manufacturing	\$3,975,000	\$0
Non-Residential Building Construction	\$1,803,160	\$1,115,640
Professional, Scientific & Technical Services	\$8,954,500	\$504,000
Professional, Scientific, Computer & Electronic Equipment Manufacturing	\$385,000	\$0
Transport	\$61,000	\$0
Specialist & Other Machinery & Equipment Manufacturing	\$4,930,600	\$525,000
Structural Metal Product Manufacturing	\$616,000	\$264,000
Wholesale Trade	\$165,000	\$0
Accommodation & Food Services	\$38,400	\$0
Auxiliary Finance & Insurance Services	\$1,669,000	\$0
Construction Services	\$2,798,320	\$1,091,280
Total	\$27,968,600	\$5,660,700

Operational phase

Minor changes to operational workforce numbers were provided for this assessment, including the addition of some local and Sydney-based staff. The direct jobs modelled during the operational phase reflect the marginal increase in jobs from the project overall (not just the facility), including facility operations staff, Sundown staff (covering trades, management and support roles), as well as NSW-based Hiringa staff, which include management and administration roles. A breakdown of the operational jobs applied in the modelling are outlined in Table 11.

Table 11 Additional job allocation by role and location

Project Breakdown	Roles	Location	FTE
Hiringa	Management	NSW	0.1
	Governance	NSW	0.3
	Admin	NSW	0.1
	Trading	NSW	0.2
Sundown	Governance	Moree	0.2
	Operations	Moree	2
	Support	Moree	0.1
Operations	Operators	Moree	5
	Facility Engineer and Ops Manager/Supervisor	NSW	0.5
	Facility Supervisor	Moree	1
	Trainee - Apprentice	Moree	1
Total FTE for FER region			9.3
Total FTE for NSW region			10.5

The financial plan provided as part of the original assessment, included detailed revenue and cost estimates over 20-year timeframe and has been applied in this updated analysis.

As with the original analysis, upon completion of the new facility operations are anticipated to commence at full capacity (i.e. there is no requirement to scale up over a period of several years).

In contrast to the short-term impact of construction activity, the operational impact of the facility is ongoing annually. However, any variation in actual economic performance of the facility site will proportionally affect the level of economic impacts. A summary of the direct changes through the operational phase applied in the modelling is outlined in Table 12.

Table 12 Marginal increase due to operational activity

Industry Sector	State analysis	FER analysis
Basic Chemical Manufacturing		
Revenue (\$)	\$12,027,740	\$12,027,740
Wages and salaries (\$)*	\$1,011,907	901,000
FTE employment	8.2	7.0
Agricultural support services		
Revenue (\$) ^	\$789,672	\$789,672
Wages and salaries (\$) ^	\$110,317	\$110,317
FTE employment	2.3	2.3
Total		
Revenue (\$)	\$12,817,412	\$12,817,412
Wages and salaries (\$)	\$1,122,225	\$1,011,317
FTE employment	10.5	9.3

Source: Hiringa Energy and REMPLAN Economy

* State analysis includes estimates of management / admin wages derived from REMPLAN economic model for NSW, based on FTE employment figures provided.

^ Derived from REMPLAN economic model for NSW, based on FTE employment figures provided.

5.2.1 EIA results

Direct economic impacts are those that result from the initial capital expenditure occurring within the local economy. This increased direct expenditure supports additional levels of economic activity in local supplying sectors, these are reported as supply chain impacts. The additional activity that occurs through direct and supply chain effects supports jobs in the local economy which is coupled with an increase in the total value of wages and salaries paid to employees. A proportion of these wages and salaries are captured within the local economy. These are reported as consumption impacts and typically occur in population serving industries such as retail trade, health care and education.

Results of the EIA for the construction phase and operational phase provided in this section have only been reported for the New South Wales economy. A summary of construction and operational phase impacts have been provided for New South Wales and the FER region at the end of each respective section.

Construction phase impacts – New South Wales

Output: The direct local expenditure of \$33.63 million within New South Wales on construction and set-up costs will generate an additional demand for intermediate goods and services of \$23.19 million. This represents a Type 1 Output multiplier of 1.69. These supply chain effects include multiple rounds of flow-on effects, as servicing sectors increase their own output and demand for local goods and services in response to the direct change to the economy.

The increases in direct and indirect output would typically correspond to the creation of jobs in the economy. Corresponding to this change in employment would be an increase in the total of wages and salaries paid to employees in the region. A proportion of these wages and salaries are typically spent on consumption and a proportion of this expenditure is captured in the local economy. The consumption effects under this scenario are estimated at \$19.30 million.

Total output, including all direct, supply chain and consumption effects is estimated to increase by up to \$76.11 million over the construction period. This represents a Type 2 Output multiplier of 2.26.

Value-added: From a direct increase in revenue for local businesses \$33.63 million, the corresponding increase in direct value-added in New South Wales is estimated at \$11.08 million. Flow-on supply chain effects in terms of local purchases of goods and services (indirect impacts) would result in a further increase to value-added of \$9.13 million. This represents a Type 1 value-added multiplier of 1.82.

The consumption effects under this scenario are expected to further boost value-added by \$9.87 million. Total value-added, including all direct, supply chain and consumption effects is estimated to increase by up to \$30.07 million. This represents a Type 2 value-added multiplier of 2.71.

Employment: The construction expenditure corresponds to the creation of 59.6 direct FTE jobs. The indirect impacts would result in a further 45.6 jobs. This represents a Type 1 Employment multiplier of 1.77. The consumption effects under this scenario are estimated to further boost employment by 40.3 jobs. Total employment, including all direct, supply chain and consumption effects is estimated to increase by up to 145.5 FTE jobs across the State. This represents a Type 2 Employment multiplier of 2.44.

It is important to note that these are not annual job numbers, but the number that would be supported across the total construction period. In years where expenditure is higher, this would typically translate to a greater number of jobs being supported in that year. For example, the level of activity may support 45 jobs in the first year and 100 jobs in the second year.

Construction phase summary

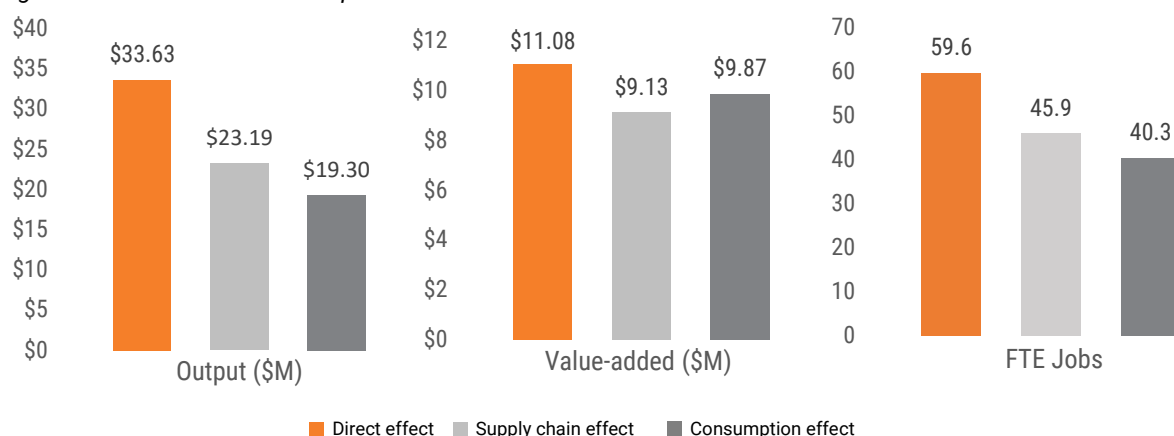
Total economic impacts in New South Wales over the construction phase, including all direct and indirect economic effects, are anticipated to support up to:

- \$76.11 million in increased output/revenue for local business
- \$30.07 million in value-added
- 146 jobs in the State's economy over construction phase.

The Type 2 output multiplier for the construction phase is 2.26. That is, for every dollar spent on goods and services from businesses within the State, a further \$1.26 is captured within the New South Wales economy.

For employment, the Type 2 multiplier is slightly higher at 2.44. That is, for every direct FTE job supported through the construction phase, another 1.4 FTE jobs are supported within the local economy.

Figure 17 Construction Phase Impacts – New South Wales



Construction phase EIA summaries

Table 13 Construction Phase Summary – New South Wales

Impact Summary	Direct Effect	Supply Chain Effect	Consumption Effect	Total Effect	Type 2 Multiplier
Output (\$M)	\$33.63	\$23.19	\$19.30	\$76.11	2.26
Value-Added (\$M)	\$11.08	\$9.13	\$9.87	\$30.07	2.71
Employment (FTE Jobs)	59.6	45.9	40.3	145.5	2.44

Table 14 Construction Phase Summary – FER Region

Impact Summary	Direct Effect	Supply Chain Effect	Consumption Effect	Total Effect	Type 2 Multiplier
Output (\$M)	\$5.66	\$2.35	\$0.98	\$8.99	1.59
Value-Added (\$M)	\$1.54	\$0.86	\$0.58	\$2.98	1.94
Employment (FTE Jobs)	8.5	5.2	2.3	16.1	1.89

Operational Phase Impacts – New South Wales

All economic impacts refer to the annual impact of the operations of the proposed facility.

Output: From a direct increase in annual output of \$12.82 million it is estimated that the demand for intermediate goods and services in New South Wales would increase by \$5.56 million (Type 1 Output multiplier of 1.43). These annual supply chain effects include multiple rounds of flow-on effects.

The increases in output typically correspond to the creation of additional jobs and payment of wages and salaries in the region. A proportion of these wages are typically spent on consumption and a proportion of this expenditure is captured in the New South Wales economy. The consumption effects under this scenario are estimated at \$2.91 million. Total output, including all direct, supply chain and consumption effects is estimated to increase by up to \$21.29 million per annum. This represents a Type 2 Output multiplier of 1.66.

Value-added: From a direct increase in annual output of \$12.82 million, the corresponding increase in direct value-added in New South Wales is estimated at \$2.35 million. Flow-on supply chain effects in terms of local purchases of goods and services (indirect impacts) would result in a further increase to value-added of \$2.08 million. This represents a Type 1 Value-added multiplier of 1.88.

The consumption effects under this scenario are expected to further boost value-added by \$1.49 million. Total value-added, including all direct, supply chain and consumption effects is estimated to increase by up to \$5.92 million per annum. This represents a Type 2 Value-added multiplier of 2.52.

Employment: The new facility will support 10.5 direct jobs, including 7.5 jobs on-site for the ammonia facility, 2.3 additional jobs at Sundown Pastoral, and 0.7 additional jobs in management and admin roles at Hiringa Energy. From a total of 10.5 direct jobs supported in New South Wales, with the indirect impacts resulting in a further 9.6 jobs. This represents a Type 1 Employment multiplier of 1.92. The consumption effects under this scenario are estimated to further boost employment by 6.1 jobs. Total employment, including all direct, supply chain and consumption effects is estimated to increase by up to 26.2 jobs. This represents a Type 2 Employment multiplier of 2.50.

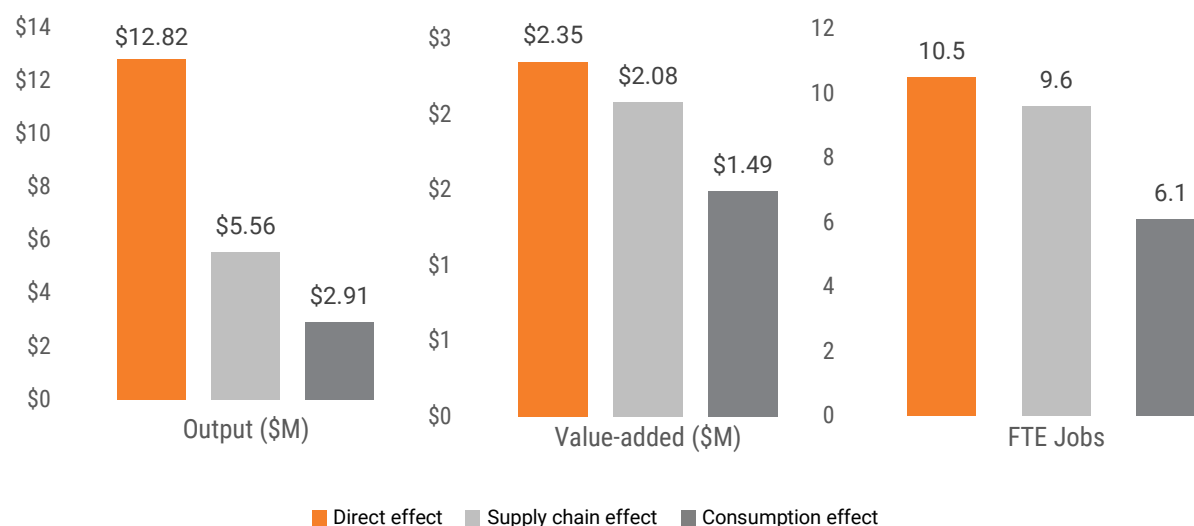
Operational phase summary

Total annual operational economic impacts from 2026, including all direct and indirect economic impacts, in New South Wales is anticipated to support up to:

- \$21.29 million per year in revenue for local businesses and organisations each year
- \$5.92 million per annum in value-added
- 26.2 FTE jobs within the State's economy.

The Type 2 multiplier for employment during the operation phase is relatively high at 2.50. That is, for every new ongoing job created through operation of the facility around 1.5 jobs are supported throughout the New South Wales economy. This high multiplying effect is largely a result of the productive nature of the facility which is able to generate relatively high revenue from a smaller number of on-site employees.

Figure 18 Operational Phase Impacts, 2026 onwards – New South Wales



Operation phase EIA summaries

Table 15 Summary of Annual Operation Phase Impacts – New South Wales

Impact Summary	Direct Effect	Supply chain Effect	Consumption Effect	Total Effect	Type 2 Multiplier
Output (\$M)	\$12.82	\$5.56	\$2.91	\$21.29	1.66
Value-Added (\$M)	\$2.35	\$2.08	\$1.49	\$5.92	2.52
Employment (FTE Jobs)	10.5	9.6	6.1	26.2	2.50

Table 16 Summary of Annual Operation Phase Impacts – FER Region

Impact Summary	Direct Effect	Supply chain Effect	Consumption Effect	Total Effect	Type 2 Multiplier
Output (\$M)	\$12.82	\$2.96	\$0.91	\$16.70	1.30
Value-Added (\$M)	\$2.35	\$1.03	\$0.55	\$3.93	1.67
Employment (FTE Jobs)	9.3	5.5	2.2	16.9	1.82