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E. 12 | Economic Assessment

Dinawan Solar Farm Economic Assessment

Prepared for

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EXECUTIVE SUMMARY

Introduction

Spark Renewables Pty Limited (Spark Renewables) proposes to develop the Dinawan Solar Farm, a large-scale solar photovoltaic (PV) generation facility and battery energy storage system (BESS), supported by associated infrastructure (the project). The project will have a generation capacity of up to approximately 800 megawatts (MW) (AC), equivalent to the needs of 300,000 NSW households per year. It will assist in meeting NSW and Australian Government emissions reduction targets and will abate approximately 1.5 million tonnes of greenhouse gases (GHG) annually. The project is State significant development (SSD) pursuant to schedule 1 of State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP).

The project is on the traditional lands of the Wiradjuri people and several smaller nations of the Murrumbidgee plains, about halfway between the towns of Coleambally and Jerilderie and lies within the Murrumbidgee local government area (LGA) in New South Wales (NSW).

This Economic Assessment analyses the potential economic impacts of the construction and operation of the project on the regional and NSW economy. It forms part of the Environmental Impact Statement (EIS) for the project.

The impacts have been assessed in accordance with the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning and Environment (DPE) and against the relevant legislation and guidelines as they apply to economics.

The project would provide economic activity to the regional and NSW economy during both construction and operation. It would also result in some reduction in regional economic activity from foregone potential agricultural production within the development footprint.

Economic activity impacts in the regional and NSW economy arise from changes in:

- expenditure in the region on non-labour inputs to production;
- direct employment of local labour or in migration of labour; and
- expenditure of labour wages in the local economy.

Methodology

These regional and NSW economic impacts are assessed using input-output (IO) analysis. Qualitative consideration is also given to potential impacts of the project, and cumulative projects, on demand for regional and NSW labour resources and other inputs to production.

Existing environment

The regional economy is defined as the combined LGAs of Murrumbidgee, Edward River, Griffith, Leeton, and Narrandera. This encompasses the region within an approximately one-hour drive from the project, which has the potential to provide labour and nonlabour inputs to, and derive economic benefits from, the construction and operation of the project. It is also the region that may experience impacts from reduction in agricultural activity and from increased demand for labour and other inputs to production. While the region is the focus of the analysis, impacts on the NSW economy are also assessed.

The population of the region in 2021 was 56,045 and has been growing at approximately seven per cent of the rate of NSW. This population growth rate is largely driven by the population growth rate for Griffith LGA. The population for all other LGAs in the region has declined since 2006.

Griffith LGA accounts for 48 per cent of the total population and 51 per cent of the total labour force. Together the Griffith LGA and Leeton LGA account for 69 per cent of the regional population and 71 per cent of the regional labour force. Aggregated one-digit Australian and New Zealand Industry Classification (ANZSIC) place of work data indicates the significance of the Manufacturing sectors, Agriculture, Forestry and Fishing sectors, and Health Care and Social Assistance sectors. However, the main employment in the region varies between LGAs. The main employment sector in the Griffith and

Leeton LGAs is Manufacturing, while the main employment sector in the Murrumbidgee and Narrandera LGAs is Agriculture, Forestry and Fishing. The main employment sector in Edward River is Health Care and Social Assistance.

Exporting sectors are key drivers of regional economies and reflect a region's endowments and competitive advantages. Using the one-digit ANZSIC, the largest exporting industries in the region by value are Manufacturing, Utilities, Construction, Education and Training, and Agriculture, Forestry and Fishing.

Potential construction impacts

The average annual construction impacts of the project on the regional economy for the peak 12-months of construction are estimated at up to:

- \$191M in annual direct and indirect output.
- \$69M in annual direct and indirect value-added.
- \$36M in annual direct and indirect household income.
- 489 direct and indirect jobs.

The impacts for year 1 of construction (average annual employment of 214) and year 3 of construction (average annual employment of 132) would be smaller, in proportion to the average annual employment levels.

The average annual construction impacts of the project on the NSW economy for the peak 12-months of construction are estimated at up to:

- \$339M in annual direct and indirect output.
- \$143M in annual direct and indirect value added.
- \$93M in annual direct and indirect household income.
- 973 direct and indirect jobs.

As for regional impacts, the impacts on NSW in year 1 and year 3 of construction would be smaller and in proportion to average annual employment levels.

The construction phase of the project will result in a temporary reduction in up to 2,499 ha of land available for agricultural activity – sheep and cattle (beef) grazing. The economic activity impacts associated with this were assessed and identified as negligible relative to the economic activity impacts of project construction.

The construction of the project will create demand for regional labour resources and regional inputs to production. However, this is not expected to lead to any observable impacts on regional wages or prices.

Potential operational impacts

The project's operation is estimated to make up to the following total annual contribution to the regional economy:

- \$29M in annual direct and indirect regional output.
- \$11M in annual direct and indirect regional value-added.
- \$3M in annual direct and indirect household income.
- 34 direct and indirect jobs.

The project's operation is estimated to make up to the following total annual contribution to the NSW economy:

- \$49M in annual direct and indirect regional output.
- \$22M in annual direct and indirect regional value-added.

- \$10M in annual direct and indirect household income.
- 92 direct and indirect jobs.

The construction and operation impacts are larger for the NSW economy because there is less leakage of direct and indirect expenditure out of the NSW economy compared to the regional economy (i.e., the NSW economy because of its size and diversity is better placed to provide more of the inputs to production than the regional economy).

Businesses that can provide the inputs to the production process required by the project and/or the products and services required by the workforce would directly benefit from the project by way of increased economic activity. However, because of the inter-linkages between sectors, many indirect businesses also benefit.

The project's operation will have more minor agricultural impacts than the construction phase because sheep are intended to graze between solar panels and other infrastructure. The level of agricultural impact during the operation of the project is considered negligible.

The operation of the project will create a small demand for regional labour resources and regional inputs to production. Consequently, no wage or price increases or production shortages are anticipated.

Cumulative impact assessment

The main cumulative economic impact of this and other prospective projects in the region is to generate large demand for a suitably qualified construction workforce in the region and surrounds. This demand can help address the jobs growth imbalance between Australia's biggest cities and regions. The project will provide opportunities for the existing and future regional workforces, attracting middle skilled and high skilled workers and families to regional areas, reducing outmigration of the regional workforce to look for employment in cities, and increase regional labour force participation.

Notwithstanding, cumulative demand for construction workers can in the short run potentially lead to increased construction wages, attraction of workers from other relevant sub-sectors and sectors of the economy leading to labour shortages in these other areas of the economy (and associated shortages of goods and services), and rising inflation as firms pass wage costs onto consumers. The extent of these impacts for regional economies will depend on the balance of labour supply from inside the region, outside the region and drive-in drive-out (DIDO)/fly-in fly-out (FIFO), as well as adjustment of the overall labour market to respond to increased demand.

In addition, in the short run, excess demand for inputs to construction such as quarry materials and concrete can result in rising costs for these factor inputs and potentially shortages for other uses.

These potential impacts will be more likely and larger as a result of cumulative projects across the region and the State, than from the individual project.

Management measures

The positive local employment and business opportunities can be maximised via:

- Employment of regional residents where they have the required skills and experience.
- Participating, as appropriate, in business groups, events or programs in the regional community.
- Locally sourcing non-labour inputs to production where local producers can be cost and quality competitive.
- Establishment of a Community Benefit Fund to be managed through a Voluntary Planning Agreement with Murrumbidgee Shire Council.
- Lease payments to host landowners that provide an alternative drought proof income with potential flow-on benefits to the regional economy.

Agricultural activities are expected to continue during the operational phase of the project and pre-project agricultural production will be reinstated following project decommissioning.

1 INTRODUCTION

1.1 Project overview

Spark Renewables Pty Limited (Spark Renewables) proposes to develop the Dinawan Solar Farm, a large-scale solar photovoltaic (PV) generation facility and battery energy storage system (BESS), supported by associated infrastructure (the project). The project is on the traditional lands of the Wiradjuri people and several smaller nations of the Murrumbidgee plains, about halfway between the towns of Coleambally and Jerilderie and lies within the Murrumbidgee local government area (LGA) in New South Wales (NSW).

The project area is approximately 4,222 ha and encompasses 56 land parcels. The land within the project area is currently used for sheep and cattle grazing. Within the project area, the development footprint is expected to be around 2,499 ha. The development footprint is the maximum extent of ground disturbing works associated with the construction and operation of the project.

The project is part of the Dinawan Energy Hub, a hybrid wind, solar and battery storage hub. The project is within the South-West Renewable Energy Zone (REZ), a region selected by the NSW Government due to its significant potential for renewable energy infrastructure and regional development. The project will connect to the Dinawan Substation, which will be built by Transgrid as part of the Project EnergyConnect interconnector that will run between Robertstown in South Australia and Wagga Wagga in NSW.

The main objective of the project is to generate renewable energy, consistent with NSW Government policy for development of infrastructure for renewable energy generation and storage, and will significantly contribute to the target of 2.5 gigawatts (GW) of generation planned in the South-West REZ. The project will have a generation capacity of up to approximately 800 megawatts (MW) (AC), and produce the equivalent energy needs of up to 300,000 NSW households per year. It will assist in meeting NSW and Australian Government emissions reduction targets and will abate approximately 1.5 million tonnes of greenhouse gases (GHG) annually. The BESS will have a capacity of up to approximately 300 MW (AC coupled) and will have provision for up to 2 hours of storage (600 MWh).

1.2 Purpose of this report

The project is State significant development (SSD) pursuant to schedule 1 of State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP). Accordingly, approval for the project is required under part 4, division 4.7 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). In accordance with the provisions of the EP&A Act, a development application (DA) for SSD must be accompanied by an environmental impact statement (EIS) that is lodged with the NSW Department of Planning and Environment (DPE) for development consent.

This economic assessment has been prepared to inform the EIS and DA for the project.

1.3 Assessment guidelines and requirements

This assessment has been prepared in accordance with requirements of DPE, which were set out in the Planning Secretary's Environmental Assessment Requirements (SEARs) for the project, issued on 14 December 2022. The SEARs identify matters which must be addressed in the EIS. Table 1.1 lists individual requirements relevant to this economic assessment and where they have been addressed.

Table 1.1 – Economic Assessment Related SEARs

Requirement	Section addressed
The EIS must include:	
an assessment of the economic impacts or benefits of the project for the region and the State as a whole,	Chapters 4, 5 and 6 of this report.
and provide details of any proposed voluntary benefit sharing programs in accordance with the Solar Guideline	See the Social Impact Statement

There are no economic assessment guidelines for SSD renewable energy projects.

1.4 Structure of the report

This report is structured as follows:

- Section 2 outlines the methodology used for the Economic Assessment.
- Section 3 provides an overview of the regional economy within which the project is located.
- Section 4 assesses the economic impacts of construction of the project on the regional and NSW economy.
- Section 5 assesses the economic impacts of operation of the project on the regional and NSW economy.
- Section 6 considers potential cumulative impacts on the region and State.
- Section 7 identifies measures to mitigate and manage economic impacts.
- Section 8 provides the conclusions of the assessment.

2 METHODOLOGY

2.1 Overview

The project would generate economic activity within the regional and NSW economy, during both construction and operation. It would also result in a minor contraction in agricultural economic activity from the construction and operation of the project within the development footprint. The assessment of these potential economic impacts has been undertaken using input-output (IO) analysis. Other potential impacts are discussed qualitatively.

2.2 Study area

The study area/regional economy for this economic assessment is defined as the combined LGAs of Murrumbidgee, Edward River, Griffith, Leeton, and Narrandera. Parts of these LGAs are approximately one hour drive from the project, and therefore have the potential to provide labour and nonlabour inputs to, and derive economic benefits from, the construction and operation of the project. It is also the region that may experience impacts from reduction in agricultural activity and from increased demand for labour and other inputs to production. While the region is the focus of the analysis, impacts on the NSW economy are also assessed.

2.3 Description of the regional economy

Prior to the assessment of impacts using IO analysis, a description of the regional economy is provided. This is based on Australian Bureau of Statistics (ABS) Census of Population and Housing data and information from the model of the regional economy developed for the IO analysis. Data is provided at different levels of aggregation i.e., one-digit and four-digit Australian and New Zealand Standard Industrial Classification (ANZSIC), to provide a more complete picture of the regional economy.

2.4 Input-output analysis

IO analysis is used to assess the direct and indirect impacts (gross economic footprint) of the construction and operation of the project on the regional and NSW economy.

IO analysis involves two key steps:

- Development of an appropriate IO table (regional transaction table) that can be used to identify the economic structure of the region and multipliers for each existing sector of the economy. IO tables for the regional and NSW economy were developed using the Generation of Regional Input Output Tables (GRIT) procedure developed by the University of Queensland and recognised internationally - Refer to Attachment 1.
- Identification of the direct impact or stimulus of the project, in a form that is compatible with the IO equations, so that the IO multipliers and flow-on effects for the impacts or stimulus of the project can then be estimated (West, 1993). The direct impact of the project was estimated from data provided by Spark Renewables and production ratios in the IO tables. Indirect effects were estimated using the *EconImp* program.¹

IO analysis identifies the economic activity of a project on the economy in terms of four main indicators:

- Gross regional output – the gross value of business turnover in a region.
- Value-added – the difference between the gross value of business turnover and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output. These costs exclude wage costs.
- Income – the wages paid to employees including imputed wages for self-employed and business owners.
- Employment – the number of people employed (including self-employed, full-time, and part-time).

¹ The *EconImp* program uses the Leontif Inverse Matrix to estimate indirect effects.

The IO method is based on several assumptions that are outlined in Attachment 2. Most notably IO analysis assumes that the regional economy has access to sufficient labour and capital resources (from both inside and outside the region) so that an individual project does not result in any regional price changes e.g., wages in other industries or house rentals, which would lead to contractions (“crowding out”) of economic activity in other sectors in the same region. Any “crowding out” is assumed to occur outside the region where the project is concentrated, and the regional impact analysis is focused. A dynamic computable general equilibrium modelling approach may overcome the limitation of IO analysis but is unlikely to be warranted at local or regional scale or with small scale impacts.

The consequence of the assumptions of IO analysis, is that IO modelling provides an estimate of the gross economic impact or footprint of the project which is an upper bound estimate of net economic activity impacts.

Qualitative consideration is given to potential “crowding out” impacts from the project and cumulative projects on the region and State.

3 THE REGIONAL ECONOMY

3.1 Introduction

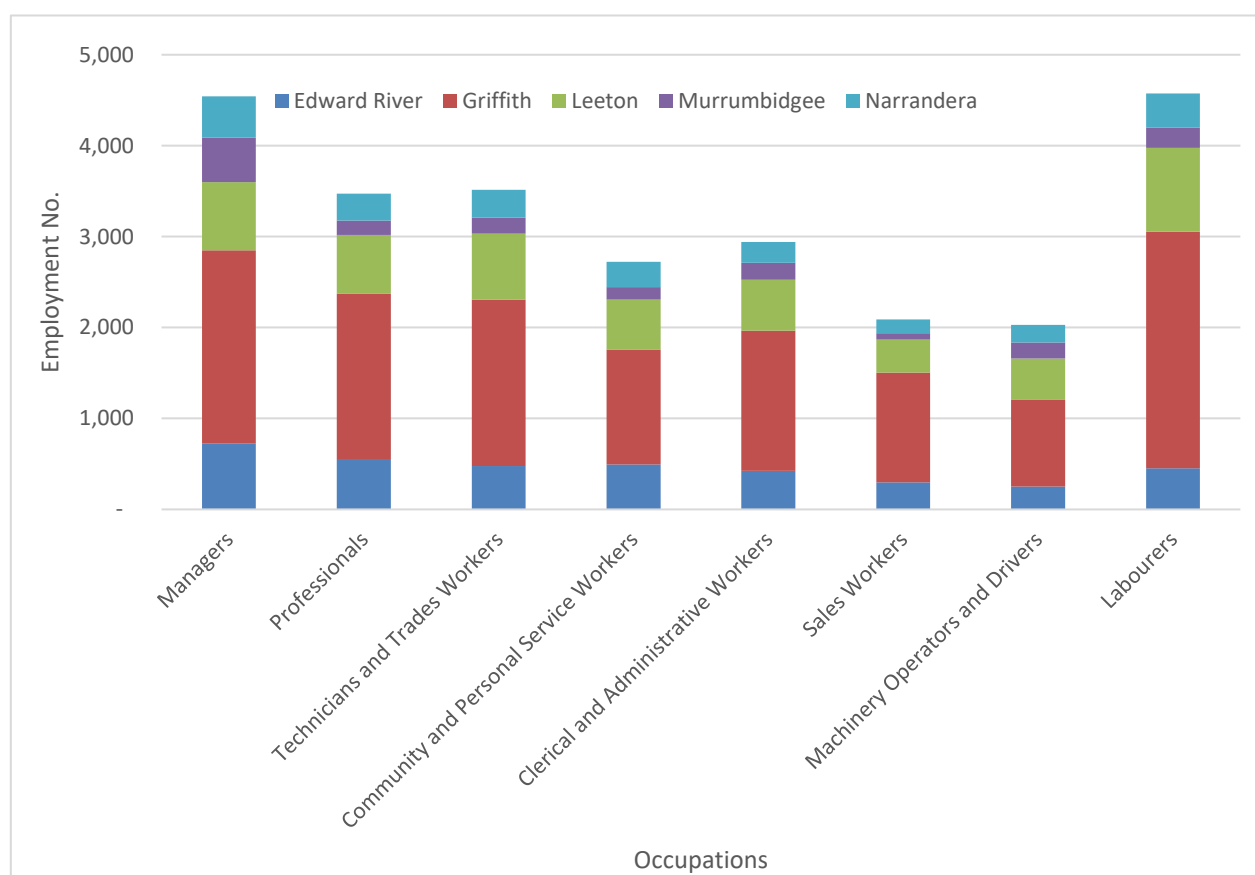
This section characterises the regional economy from two perspectives, residents of the region and workers in the region.

3.2 Residents of the Region

Table 3.1 provides some characteristics of the usual residents of the regional economy based on the 2021 ABS Census of Population and Housing. In 2021, the region had a population of 56,045 and a labour force of 27,467, with Griffith LGA accounting for 48 per cent of the total population and 51 per cent of the total labour force. Together the Griffith LGA and Leeton LGA account for 69 per cent of the regional population and 71 per cent of the regional labour force. In the 2021 Census, 942 people (about 3.4 per cent of the total regional labour force) were unemployed with the majority of these located in the Griffith LGA.

The main occupations of usual residents² in the region (Figure 3.1) were Labourers (17.7 per cent) and Managers (which includes farm managers) (17.5 per cent). While Griffith LGA has the greatest number of all occupations, the relative importance of different occupations varies by LGA. In Griffith and Leeton LGAs, the main occupation was Labourers. In Edward River, Murrumbidgee, and Narrandera LGAs, the main occupation was Managers.

Figure 3.1 – Employment by Occupation of Usual Residents



² Employed people aged 15 years and over.

Table 3.1 - Characteristics of Usual Residents

	Edward River		Griffith		Leeton		Murrumbidgee		Narrandera		Total Region		NSW	
Demographics	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Population	8,456		27,086		11,452		3,353		5,698		56,045		8,072,163	
Median Age	46		37		38		45		44		40		39	
In labour force	3,918	46.3%	14,114	52.1%	5,274	46.1%	1,698	50.6%	2,463	43.2%	27,467	49.0%	3,874,012	58.7
Unemployed	140	3.6%	423	3.0%	202	2.8%	49	2.9%	128	5.2%	942	3.4%	189,852	4.9
Median household weekly income	1,240		1,738		1,417		1,401		1,184		1,504		1,829	
Unoccupied private dwellings %	523	13.6%	753	7.5%	330	7.7%	191	12.8%	326	13.3%	2,123	9.6%	299,524	9.4
Median rent	220		290		250		190		200		259		420	
Occupations	No.	%	No.	%	No.	%	No.	%			No.	%	No.	%
Managers	728	20%	2,121	16%	751	15%	490	30%	451	20%	4,541	18%	952,131	25.8
Professionals	553	15%	1,819	14%	648	13%	158	10%	295	13%	3,473	13%	536,820	14.6
Technicians and Trades Workers	477	13%	1,832	14%	722	15%	177	11%	307	13%	3,515	14%	390,779	10.6
Community and Personal Service Workers	495	13%	1,262	9%	549	11%	137	8%	278	12%	2,721	11%	300,966	8.2
Clerical and Administrative Workers	426	12%	1,540	12%	558	11%	188	12%	230	10%	2,942	11%	436,589	11.9
Sales Workers	299	8%	1,206	9%	361	7%	71	4%	153	7%	2,090	8%	480,612	13.0
Machinery Operators and Drivers	251	7%	958	7%	451	9%	174	11%	195	9%	2,029	8%	294,889	8.0
Labourers	453	12%	2,602	20%	922	19%	222	14%	376	16%	4,575	18%	222,186	6.0

Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Community Profiles

The main four-digit ANZSIC industry sectors in which usual residents were employed in 2021 is provided in Table 3.2. *Poultry Processing, Wine and Other Alcoholic Beverage Manufacturing, Hospitals (except Psychiatric Hospitals), Supermarket and Grocery Stores, and Primary Education* were the most significant employment sectors for residents of the region reflecting the significance of these sectors to residents of Griffith LGA (which has the highest population). For residents of Murrumbidgee and Narrandera LGAs the most significant employment sectors were *Other Grain Growing*, and *Grain-Sheep or Grain-Beef Cattle Farming*. For Edward River LGA residents, the most significant employment sectors were *Other Social Assistance Services* and *Hospitals (except Psychiatric Hospitals)*. *Secondary Education* and *Meat Processing* were the most significant employment sectors for residents of Leeton LGA.

5.7 per cent of employed usual residents work outside the region, mainly 'no fixed address' (NSW) (3.0%), and Carrathool LGA (0.8%).

Table 3.2 - Top 5 Industry Sectors of Employment for Usual Residents (Four Digit ANZSIC)

Edward River	%	Leeton	%	Griffith	%	Murrumbidgee	%	Narrandera	%	Total Region	%
Other Social Assistance Services	5%	Secondary Education	5%	Poultry Processing	7%	Other Grain Growing	10%	Other Grain Growing	4%	Poultry Processing	4%
Hospitals (except Psychiatric Hospitals)	4%	Meat Processing	5%	Wine and Other Alcoholic Beverage Manufacturing	6%	Grain-Sheep or Grain-Beef Cattle Farming	9%	Grain-Sheep or Grain-Beef Cattle Farming	4%	Wine and Other Alcoholic Beverage Manufacturing	3%
Grain-Sheep or Grain-Beef Cattle Farming	3%	Grain Mill Product Manufacturing	4%	Hospitals (except Psychiatric Hospitals)	3%	Local Government Administration	5%	Local Government Administration	4%	Hospitals (except Psychiatric Hospitals)	3%
Primary Education	3%	Supermarket and Grocery Stores	3%	Supermarket and Grocery Stores	3%	Agriculture, nfd	4%	Aged Care Residential Services	4%	Supermarket and Grocery Stores	3%
Supermarket and Grocery Stores	3%	Primary Education	3%	Primary Education	3%	Poultry Processing	3%	Meat Processing	4%	Primary Education	3%

Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Community Profiles

An indication of the health of an economy can be gained from population changes. This theory of regional economic growth suggests that places that can attract population immigration³ create increased demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability (Sorensen, 1990). Conversely, population losses can contribute to a cycle of decline whereby reduced populations results in closure of services, which in turn makes it difficult to attract new populations (Sorensen, 1990).

Trends in regional economies of NSW because of globalisation and associated structural adjustment include:

- Loss of significant industries such as abattoirs and timber mills from many rural areas.
- Increased mechanisation of agriculture and aggregation of properties, resulting in loss of employment opportunities in this industry.
- Growth of regional centres, at the expense of smaller towns.
- Preference of Australians for coastal living, particularly for retirement.
- Preference of many of today's fastest growing industries for locating in large cities (Collits, 2000).

³ Mainly due to natural endowments and comparative advantage in certain industry sectors.

The result is that there has been declining population in many rural LGAs that are in non-coastal areas in NSW. There has also been a decline in the population of smaller towns even in regions where the population has been growing.

Against this backdrop, it is evident that the population of the regional economy has been growing at an average annual rate of 0.09 per cent since 2006, compared to 1.34 per annum for NSW. This population growth rate is largely driven by the population growth rate for Griffith LGA (i.e., average annual growth rate of 0.7 per cent since 2006). The population for all other LGAs in the region has declined since 2006.

Table 3.3 – Population growth

Local Government Area	Population				Average Annual Growth Rate			
	2006	2011	2016	2021	2006 – 2011	2011 – 2016	2016 – 2021	2006 – 2021
Edward River	9,287	8,888	8,991	8,437	-0.86%	0.23%	-1.23%	-0.61%
Griffith	24,450	25,395	26,356	27,182	0.77%	0.76%	0.63%	0.74%
Leeton	11,562	11,406	11,407	11,481	-0.27%	0.00%	0.13%	-0.05%
Murrumbidgee	4,219	3,888	3,929	3,564	-1.57%	0.21%	-1.86%	-1.04%
Narrandera	6,149	6,115	5,949	5,731	-0.11%	-0.54%	-0.73%	-0.45%
Total Region	55,667	55,692	56,632	56,395	0.01%	0.34%	-0.08%	0.09%
NSW	6,742,690	7,218,529	7,732,858	8,093,815	1.41%	1.43%	0.93%	1.34%

Source: Australian Bureau of Statistics, 2023 Estimated Resident Population, Local Government Areas, Australia

The population of the region (Table 3.4) is predicted to continue to grow at an average annual rate of 0.3 percent (less than a third of that for NSW), largely driven by population growth in the Griffith LGA. The population for all other LGAs in the region is forecast to remain relatively constant or decline (NSW DPE, 2022).

Table 3.4 – Projected population growth

Local Government Area	2021	2041	Change	Annual %
Edward River	9,073	9,012	-61	0.0%
Griffith	27,063	31,641	4,578	0.8%
Leeton	11,302	11,061	-241	-0.1%
Murrumbidgee	3,895	3,998	103	0.1%
Narrandera	5,789	5,373	-416	-0.4%
Total Region	57,122	61,085	3,963	0.3%
NSW	8,166,757	9,872,934	1,706,177	1.0%

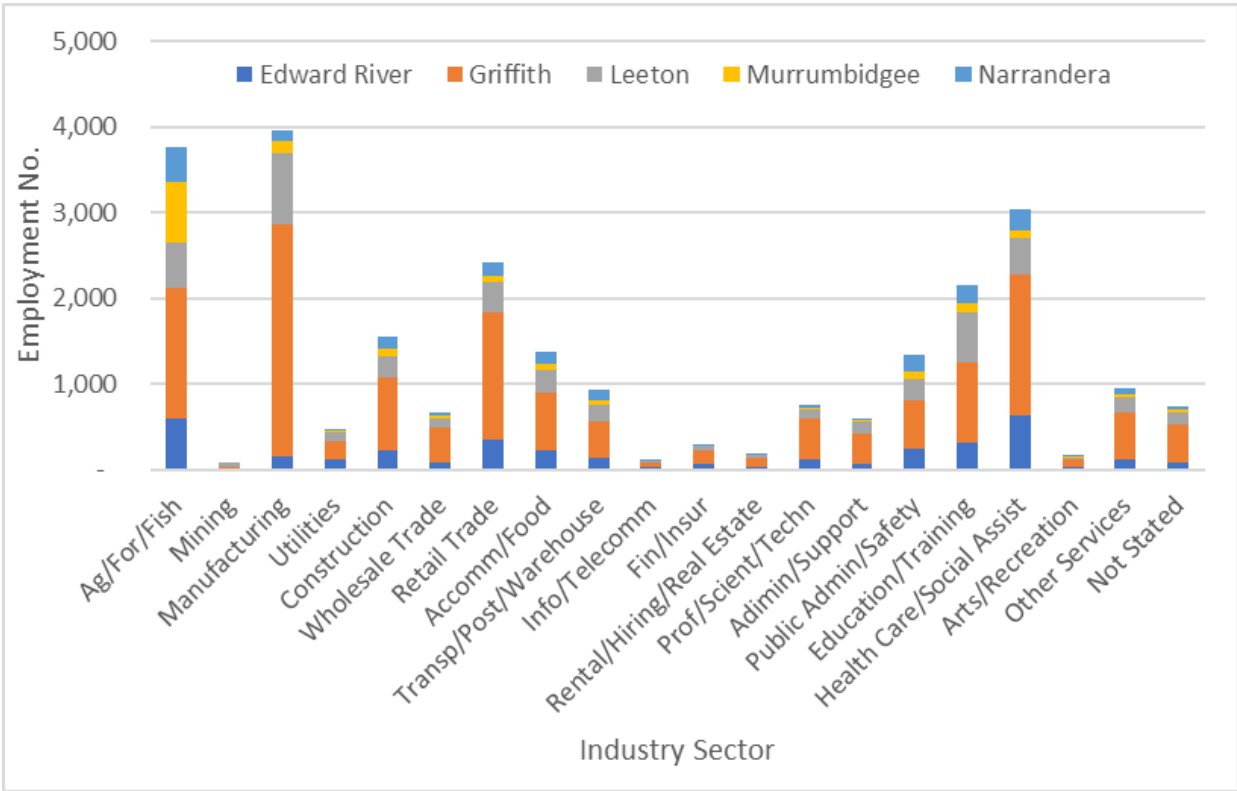
Source: NSW Department of Planning and Environment (2022)

3.3 Economic Activity in the Region

An indication of the nature of the regional economy can be gained by examining one-digit ANZSIC place of work employment by industry data - refer to Figure 3.2. This indicates the significance of the *Manufacturing* sectors, *Agriculture, Forestry and Fishing* sectors, and *Health Care and Social Assistance* sectors. However, the main employment in the region varies between LGAs. The main employment sector in the Griffith and Leeton LGAs is *Manufacturing*, while the main employment sector in the Murrumbidgee and Narrandera LGAs is *Agriculture, Forestry and Fishing*. The main employment sector in Edward River LGA is *Health Care and Social Assistance*.

3.2 per cent of people who work in the region live outside the region, mainly in Murray River LGA (0.8%), and Carrathool LGA (0.8%).

Figure 3.2 - Place of work employment by industry (One-digit ANZSIC)



Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Working Population Profiles

At the more disaggregated level (place of work employment by four-digit ANZSIC), the main industry sectors of employment in the region are *Poultry Processing, Wine and Other Alcoholic Beverage Manufacturing, Hospitals (except Psychiatric Hospitals), Supermarket and Grocery Stores, and Primary Education* (See Table 3.5). In Griffith and Leeton LGAs, the main industry sectors of employment are the meat manufacturing sectors of *Meat Processing* and *Poultry Processing*, respectively. In Murrumbidgee and Narrandera LGAs, the main industry sectors of employment are the agriculture sectors of *Other Grain Growing* and *Grain-Sheep or Grain-Beef Cattle Farming*, respectively. The main industry sector of employment in Edward River LGA is *Other Social Assistance services*.

Table 3.5 - Place of Work Top 5 Industry Sectors of Employment (Four-digit ANZSIC Sectors)

Edward River	%	Leeton	%	Griffith	%	Murrumbidgee	%	Narrandera	%	Total Region	%
Other Social Assistance Services	5%	Poultry Processing	8%	Meat Processing	7%	Other Grain Growing	11%	Grain-Sheep or Grain-Beef Cattle Farming	5%	Poultry Processing	4%
Hospitals (except Psychiatric Hospitals)	4%	Wine and Other Alcoholic Beverage Manufacturing	7%	Secondary Education	6%	Grain-Sheep or Grain-Beef Cattle Farming	9%	Local Government Administration	5%	Wine and Other Alcoholic Beverage Manufacturing	4%
Supermarket and Grocery Stores	4%	Hospitals (except Psychiatric Hospitals)	4%	Grain Mill Product Manufacturing	6%	Poultry Processing	6%	Other Grain Growing	5%	Hospitals (except Psychiatric Hospitals)	3%
Primary Education	4%	Supermarket and Grocery Stores	3%	Primary Education	3%	Local Government Administration	5%	Aged Care Residential Services	4%	Supermarket and Grocery Stores	3%
Grain-Sheep or Grain-Beef Cattle Farming	3%	Primary Education	3%	Supermarket and Grocery Stores	3%	Agriculture, nfd	5%	Primary Education	4%	Primary Education	3%

Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Table Builder

The Gross Regional Product (GRP) of the regional economy was estimated at \$3.4 billion for 2021 (Gillespie Economics IO Table). The largest exporting industries (One-digit ANZSIC) are:

- *Manufacturing* (\$1.7 billion), mainly *Meat and Meat Product Manufacturing, Wine, Spirit and Tobacco Manufacturing, Grain Mill and Cereal Production Manufacturing, and Basic Non-Ferrous Metal Manufacturing*
- *Utilities* (\$0.3 billion) mainly *Water Supply, Sewerage and Drainage Services*
- *Construction* (\$0.2 billion) mainly *Construction Services*
- *Education and Training* (\$0.2 billion) mainly *Primary and Secondary Education Services*
- *Agriculture, Forestry and Fishing* (\$0.1 billion) mainly *Sheep, Grains, Beef and Dairy Cattle Sector, and Other Agriculture*

In combination these five industries accounted for \$2.4 billion in total or 77% of the total exports by industry in the region.

Exporting sectors are based on a region's endowments and competitive advantages, and in terms of regional economic development are the key drivers of the economy.

In terms of value-added, the ANZSIC one-digit industry sectors of *Manufacturing, Agriculture, Forestry and Fishing, Rental, Hiring and Real Estate Services, Health Care and Social Assistance, and Utilities* had the highest value-added in total, equal to approximately 52% of the regional economy and 46% of regional employment - Table 3.6.⁴

⁴ Gross Value Added (GVA) measures the value of goods and services produced in a region.

Table 3.6 - Gross Value Added for the 5 Largest Industries in the regional economy (ANZSIC One Digit)

Industry	Gross Value Added (\$m)	Proportion of Regional Economy (%)	Proportion of Regional Employment (%)
Manufacturing	463	14%	16%
Agriculture/Forestry/Fishing	461	14%	15%
Rental, Hiring and Real Estate Services	316	9%	1%
Health Care and Social Assistance	267	8%	12%
Utilities	237	7%	2%
Total	1,744	52%	46%

Source: Gillespie Economics IO table of the regional economy

4 CONSTRUCTION ASSESSMENT

4.1 The project

The project would provide economic activity to the regional and NSW economy during construction. It could also result in some reduction in regional economic activity from foregone agricultural activity within the development footprint.

4.1.1 Impacts

Construction expenditure is associated with manufacturing of equipment and expenditure across the following three construction sectors of the IO industry classification:

- The *Heavy and Civil Engineering Construction Sector* which includes businesses involved in engineering construction and project management services for a diverse range of activities including on-site assembly of heavy electrical machinery from prefabricated components, transmission lines, road construction etc.
- The *Construction Services Sector* which includes businesses involved in earthmoving work such as levelling of construction sites, excavation of foundations, trench digging, concreting services, electrical services, hire of earthmoving plant with operator etc.
- The *Non-Residential Building Construction Sector* which includes businesses engaged in the construction of industrial buildings.

Conservatively, all machinery manufacturing is assumed to occur outside the region/NSW.

Over the three-year construction phase, monthly employment is estimated to peak at 400, with average annual employment for the peak 12-months of construction (month 13 to month 24) being 330.⁵

Based on the IO coefficients of the abovementioned three construction sectors in the regional IO table, \$119M of expenditure would be required across these sectors to generate this level of onsite workforce for a year.

The estimated direct and indirect regional economic impact of \$119M expenditure in the regional and NSW economy is reported in Tables 4.2 and 4.3.

Table 4.2 – Average Annual Economic Impacts of the Project's Construction on the Regional Economy (\$2023)

	Direct	Production induced	Consumption induced	Total Flow on	TOTAL EFFECT
OUTPUT (\$M)	119	64	8	72	191
<i>Type 11A Ratio</i>	1.00	0.54	0.07	0.61	1.61
VALUE ADDED (\$M)	48	16	5	21	69
<i>Type 11A Ratio</i>	1.00	0.34	0.09	0.43	1.43
INCOME (\$M)	26	8	2	10	36
<i>Type 11A Ratio</i>	1.00	0.32	0.06	0.39	1.39
EMPL. (No.)	330	127	32	159	489
<i>Type 11A Ratio</i>	1.00	0.39	0.10	0.48	1.48

Note: Totals may have minor discrepancies due to rounding.

⁵ The IO model of the regional economy is based on average annual revenue, expenditure, and employment for each industry sector. So, to model impacts it is necessary to base it on average annual employment impacts rather than peak employment.

Table 4.3 – Average Annual Economic Impacts of the Project's Construction on the NSW Economy (\$2023)

	Direct	Production induced	Consumption induced	Total Flow on	TOTAL EFFECT
OUTPUT (\$M)	119	134	86	220	339
<i>Type 11A Ratio</i>	1.00	1.12	0.72	1.85	2.85
VALUE ADDED (\$M)	48	47	48	95	143
<i>Type 11A Ratio</i>	1.00	0.98	1.01	1.98	2.98
INCOME (\$M)	35	33	25	58	93
<i>Type 11A Ratio</i>	1.00	0.94	0.69	1.63	2.63
EMPL. (No.)	330	334	309	643	973
<i>Type 11A Ratio</i>	1.00	1.01	0.94	1.95	2.95

Note: Totals may have minor discrepancies due to rounding.

In estimating the average annual regional impacts, it is important to separate the flow-on effects that are associated with firms buying goods and services from each other (production-induced effects) and the flow-on effects that are associated with employing people who subsequently buy goods and services as households (consumption-induced effects). This is because these two effects operate in different ways and have different spatial impacts.

Production-induced effects occur in a near-proportional way within a region, whereas the consumption-induced flow-on effects only occur in a proportional way if workers and their families are in the region or migrate into the region. Where workers commute from outside the region, some of the consumption-induced flow-on effects leak from the region.

Spark Renewables considers that 25% of the construction workforce would be sourced from the region (within approximately one hour drive of the project), with the remainder (75%) residing on-site within the construction accommodation facility (proposed in the eastern part of the development footprint – east of Kidman Way).

Based on the above, it is assumed for this analysis that approximately 75% of the consumption induced expenditure leaks from the region. Consequently, Table 4.2 has been adjusted to only include 25% of consumption-induced flow-on effects. At the NSW level, 25% of the local workforce and 50% of the nonlocal workforce are assumed to come from NSW and hence only 62.5% of consumption induced impacts are included in Table 4.3.

The average annual construction impacts of the project on the regional economy for the peak 12-months of construction are estimated at up to:

- \$191M in annual direct and indirect output.
- \$69M in annual direct and indirect value-added.
- \$36M in annual direct and indirect household income.
- 489 direct and indirect jobs.

The impacts for year 1 of construction (average annual employment of 214) and year 3 of construction (average annual employment of 132) would be smaller, in proportion to the average annual employment levels.

The average annual construction impacts of the project on the NSW economy for the peak 12-months of construction are estimated at up to:

- \$339M in annual direct and indirect output.
- \$143M in annual direct and indirect value added.
- \$93M in annual direct and indirect household income.
- 973 direct and indirect jobs.

As for regional impacts, the impacts on NSW in year 1 and year 3 of construction would be smaller and in proportion to average annual employment levels.

The impacts are larger for the NSW economy because there is less leakage of direct and indirect expenditure out of the NSW economy compared to the regional economy and hence greater production induced and consumption induced flow-on effects.

4.1.2 Multipliers

Multipliers are summary measures used for predicting the total impact on all industries in an economy from changes in the demand for the output of any one industry (ABS, 1995). There are many types of multipliers that can be generated from IO analysis (refer to Attachment 2). Type 11A ratio multipliers summarise the total impact on all industries in an economy in relation to the initial own sector effect e.g., total income effect from an initial income effect and total employment effect from an initial employment effect, etc.

At the regional level, the adjusted type 11A ratio multipliers for the construction workforce of the project range from 1.39 for income up to 1.61 for output. The NSW type 11A ratio multipliers for the construction workforce range from 2.63 for income up to 3.98 for value added. The multipliers are larger for the NSW economy because of the greater level of intersectoral linkages in the larger economy and hence larger level of flow-on impacts (i.e., less leakages compared to the regional economy).

4.1.3 Main Sectors Affected

The IO analysis indicates construction is most likely to directly impact the *Heavy and Civil Engineering Construction Sector*, *Construction Services Sector* and *Non-Residential Building Construction Sector*. Flow-on impacts from the construction of the project are likely to affect several different sectors of the regional and NSW economy.

The sectors of the regional economy most impacted by output, value-added, income and employment production induced flow-on effects are likely to be as follows:

- *Professional, Scientific and Technical Services.*
- *Wholesale and Retail Trade.*
- *Road Transport.*
- *Employment, Travel Agency and Other Administrative Services*
- *Cement Lime and Ready-Mixed Concrete Manufacturing.*
- *Structural Metal Product Manufacturing.*
- *Building Cleaning, Pest Control and Other Support Services.*

For the NSW economy the *finance sector*, *auxiliary finance and insurance sector*, and *non-residential property operators and real estate services* are also important production induced flow-on sectors.

Consumption induced flow-on effects in the region will be mainly in the following sectors:

- *Retail and Wholesale Trade.*
- *Food and Beverage Services.*
- *Health Care Services.*
- *Primary and Secondary Education.*
- *Residential Care and Social Assistance.*
- *Road Transport.*

For the NSW economy the *Finance; Professional, Scientific and Technical Services; Insurance and Superannuation; Personal Services, Employment, Travel Agency and Other Administrative Services*, are also important consumption induced flow-on sectors.

4.2 Agricultural impacts

Construction of the project will impact approximately 2,493.4 ha of agricultural land that is currently used for cattle (beef) and sheep grazing (excludes land within the development footprint currently unavailable for agricultural production). The Land and Rehabilitation Assessment identified the gross margin impact from project construction at up to \$113,059 per annum. The foregone revenue associated with this level of gross margin is estimated at \$255,180 per annum.⁶

Using revenue, expenditure and employment ratios in the *Sheep, Grain, Beef and Dairy Cattle* sector of the regional and NSW IO table, the direct and indirect impact of this level of revenue is summarised in Tables 4.5 and 4.6. Indirect impacts include economic activity associated with suppliers to agricultural production. These impacts would occur for approximately 3-years.

Table 4.5 Annual Regional Economic Impacts of Foregone Agriculture During Project Construction (\$2023)

	Direct	Production induced	Consumption induced	Total Flow on	TOTAL EFFECT
OUTPUT (\$M)	0.26	0.13	0.05	0.18	0.44
<i>Type 11A Ratio</i>	1.00	0.51	0.20	0.71	1.71
VALUE ADDED (\$M)	0.10	0.06	0.03	0.09	0.19
<i>Type 11A Ratio</i>	1.00	0.56	0.29	0.85	1.85
INCOME (\$M)	0.03	0.03	0.01	0.04	0.07
<i>Type 11A Ratio</i>	1.00	0.80	0.34	1.15	2.15
EMPL. (No.)	0.66	0.45	0.21	0.66	1.33
<i>Type 11A Ratio</i>	1.00	0.68	0.32	1.00	2.00

Table 4.6 Annual NSW Economic Impacts of Foregone Agriculture During Project Construction (\$2023)

	Direct	Production induced	Consumption induced	Total Flow on	TOTAL EFFECT
OUTPUT (\$M)	0.26	0.23	0.22	0.45	0.70
<i>Type 11A Ratio</i>	1.00	0.89	0.85	1.75	2.75
VALUE ADDED (\$M)	0.10	0.11	0.12	0.23	0.33
<i>Type 11A Ratio</i>	1.00	1.05	1.18	2.23	3.23
INCOME (\$M)	0.04	0.07	0.06	0.13	0.17
<i>Type 11A Ratio</i>	1.00	1.59	1.48	3.07	4.07
EMPL. (No.)	0.66	0.75	0.78	1.53	2.19
<i>Type 11A Ratio</i>	1.00	1.13	1.17	2.30	3.30

The annual regional direct and indirect impact of foregone agriculture during project construction is estimated at up to:

- \$0.44M in annual direct and indirect regional output.
- \$0.19M in annual direct and indirect regional value-added.
- \$0.07M in annual direct and indirect household income.

⁶ This revenue impact is estimated from the same gross margin budgets used in the Land and Rehabilitation Assessment i.e. Finish Wethers or Terminal Rams over 1,897.7 ha and Grow Out Steers over 595.7ha, with a stocking rate of 10% of that assumed in the Gross Margin Budgets. Revenue impacts are estimated because assessment of impacts using input-output analysis is driven by changes in revenue.

- 1 direct and indirect jobs.

This represents less than 0.05% of direct agricultural economic activity in the region.

It is evident from the above that agricultural impacts from the construction of the project are negligible.

4.3 Other impacts

The construction of the project will create demand for regional labour resources and regional inputs to production. Where there is excess capacity in the regional economy, or the region has access to labour and other resources from outside the region, this demand will increase economic activity in the region as per the above analysis.

Non-marginal changes in labour demand from an individual project can in the short run potentially lead to increased construction wages, attraction of workers from other relevant sectors of the economy leading to labour shortages in these other areas of the economy (and associated shortages of goods and services), rising inflation as firms pass wage costs onto consumers etc. The extent of these impacts for regional economies will depend on the balance of labour supply from inside the region, outside the region and drive-in drive-out (DIDO)/fly-in fly-out (FIFO), as well as adjustment of the overall labour market to respond to increased demand e.g., increased labour force participation.

In addition, in the short run, excess demand for inputs to construction of an individual project such as quarry materials, concrete, etc. can result in rising costs for these factor inputs and potentially shortages for other uses.

Notwithstanding, whether, and the extent to which these types of effects will arise from an individual project is uncertain. For this project where direct average annual construction demand during the peak year of construction is for in the order of 330 workers, no or modest observable price effects are anticipated. In any case, any "crowding out" of other economic activities represents the operation of the market system where scarce resources are reallocated to where they are most highly valued and where society will benefit the most from them. This reallocation of resources is therefore a positive impact for the economy not a negative.

5 OPERATION ASSESSMENT

5.1 The project

For the analysis of the operational phase of the project, a new project operation sector was inserted into regional and NSW IO tables reflecting average annual operation.

This sector was based on an estimated operational employment of 10 (100% of which are assumed to reside in the region) and an output and expenditure profile as per the coefficients in the *Electricity Generation* sector of the region and NSW IO models.

5.1.1 Impacts

On this basis the total and disaggregated average annual impacts of the project on the regional and NSW economy (in 2023 dollars) is shown in Tables 5.1 and 5.2.

Table 5.1 – Annual Economic Impacts of the Project on the Regional Economy (\$2023)

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
OUTPUT (\$M)	20	7	2	10	29
<i>Type 11A Ratio</i>	1.00	0.38	0.13	0.51	1.51
VALUE ADDED (\$M)	7	3	1	5	11
<i>Type 11A Ratio</i>	1.00	0.46	0.21	0.68	1.68
INCOME (\$M)	2	1	1	2	3
<i>Type 11A Ratio</i>	1.00	0.66	0.32	0.97	1.97
EMPL. (No.)	10	14	10	24	34
<i>Type 11A Ratio</i>	1.00	1.36	1.02	2.38	3.38

Table 5.2 – Annual Economic Impacts of the Project on the NSW Economy (\$2023)

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
OUTPUT (\$M)	20	17	12	29	49
<i>Type 11A Ratio</i>	1.00	0.88	0.62	1.50	2.50
VALUE ADDED (\$M)	7	8	7	15	22
<i>Type 11A Ratio</i>	1.00	1.21	1.00	2.21	3.21
INCOME (\$M)	2	4	3	8	10
<i>Type 11A Ratio</i>	1.00	2.60	2.06	4.66	5.66
EMPL. (No.)	10	38	44	82	92
<i>Type 11A Ratio</i>	1.00	3.82	4.37	8.19	9.19

During operations, the project is estimated to make up to the following total annual contribution to the regional economy:

- \$29M in annual direct and indirect regional output.
- \$11M in annual direct and indirect regional value-added.
- \$3M in annual direct and indirect household income.
- 34 direct and indirect jobs.

During operations, the project is estimated to make up to the following total annual contribution to the NSW economy:

- \$49M in annual direct and indirect regional output.
- \$22M in annual direct and indirect regional value-added.
- \$10M in annual direct and indirect household income.
- 92 direct and indirect jobs.

The impacts are larger for the NSW economy because there is less leakage of direct and indirect expenditure out of the NSW economy compared to the regional economy.

5.1.2 Multipliers

The Type 11A ratio multipliers for the project's impact on the regional economy range from 1.51 for output up to 3.38 for employment. Capital intensive developments tend to have a high level of linkage with other sectors in an economy thus contributing relatively high rates of flow-on employment while at the same time only having a lower level of direct employment (relative to output levels). This tends to lead to a relatively high ratio multiplier for employment. A lower ratio multiplier for income (compared to employment) also generally occurs because of comparatively higher wage levels in the project compared to incomes in the sectors that would experience flow-on effects from the project. Capital intensive projects also typically have a relatively low ratio multiplier for output and value-added reflecting the relatively high direct output and value-added compared to that in flow-on sectors.

The NSW Type 11A ratio multipliers for the project range from 2.50 for output up to 9.19 for employment. The multipliers are large for the NSW economy because of the greater level of intersectoral linkages in the larger economy and hence larger level of flow-on impacts (i.e., less leakages compared to the regional economy).

5.1.3 Main Sectors Affected

The sectors of the regional economy most impacted by output, value-added, income and employment production induced flow-on effects during operations are likely to be as follows:

- *Electricity Transmission, Distribution, On Selling and Electricity Market Operation.*
- *Finance.*
- *Construction Services.*
- *Auxiliary Finance and Insurance Services.*
- *Professional, Scientific and Technical Services.*
- *Employment, Travel Agency and Other Administrative Services.*
- *Wholesale Trade.*
- *Road Transport.*

For the NSW economy the *Computer Systems Design and Related Services* sector is also an important production induced flow-on sector.

Consumption induced flow-on effects in the region will be mainly in the following sectors:

- *Retail and Wholesale Trade.*
- *Food and Beverage Services.*
- *Health Care Services.*
- *Primary and Secondary Education.*
- *Residential Care and Social Assistance.*
- *Road Transport.*

For the NSW economy the *Finance; Professional, Scientific and Technical Services;* and *Insurance and Superannuation* sectors are also important consumption induced flow-on sectors.

5.2 Agricultural impacts

Conservatively, it is assumed that the operation of the project will impact 50% of the agricultural land that is impacted during construction (i.e. 1,246.7ha). On this basis, foregone agriculture revenue during the operation of the project would be in the order of \$127,590 per annum.

Using revenue, expenditure and employment ratios in the *sheep, grain, beef and dairy cattle* sector of the regional and NSW IO table, the direct and indirect impact of this level of revenue is summarised in Tables 5.3 and 5.4. Indirect impacts include economic activity associated with suppliers to agricultural production. These impacts would occur for the duration of project operations.

Table 5.3 Annual Regional Economic Impacts of Foregone Agriculture During Project Operation (\$2023)

	Direct	Production induced	Consumption induced	Total Flow on	TOTAL EFFECT
OUTPUT (\$M)	0.13	0.07	0.03	0.09	0.22
<i>Type 11A Ratio</i>	1.00	0.51	0.20	0.71	1.71
VALUE ADDED (\$M)	0.05	0.03	0.01	0.04	0.10
<i>Type 11A Ratio</i>	1.00	0.56	0.29	0.85	1.85
INCOME (\$M)	0.02	0.01	0.01	0.02	0.03
<i>Type 11A Ratio</i>	1.00	0.80	0.34	1.15	2.15
EMPL. (No.)	0.33	0.23	0.10	0.33	0.66
<i>Type 11A Ratio</i>	1.00	0.68	0.32	1.00	2.00

Table 5.4 Annual NSW Economic Impacts of Foregone Agriculture During Project Operation (\$2023)

	Direct	Production induced	Consumption induced	Total Flow on	TOTAL EFFECT
OUTPUT (\$M)	0.13	0.11	0.11	0.22	0.35
<i>Type 11A Ratio</i>	1.00	0.89	0.85	1.75	2.75
VALUE ADDED (\$M)	0.05	0.05	0.06	0.11	0.17
<i>Type 11A Ratio</i>	1.00	1.05	1.18	2.23	3.23
INCOME (\$M)	0.02	0.03	0.03	0.06	0.09
<i>Type 11A Ratio</i>	1.00	1.59	1.48	3.07	4.07
EMPL. (No.)	0.33	0.37	0.39	0.76	1.10
<i>Type 11A Ratio</i>	1.00	1.13	1.17	2.30	3.30

The annual regional direct and indirect impact of foregone agriculture during the operation of the project is estimated at up to:

- \$0.22M in annual direct and indirect regional output.
- \$0.1M in annual direct and indirect regional value-added.
- \$0.03M in annual direct and indirect household income.
- 1 direct and indirect jobs.

This represents approximately 0.02% of direct agricultural economic activity in the region.

5.3 Other impacts

The operation of the project will create a very small demand for regional labour resources (10 direct jobs in a labour market of 27,467) and regional inputs to production (that from the IO analysis represent 0.2% of interindustry transactions in the region). Consequently, no “crowding out” effects on other industry sectors are anticipated.

6 CUMULATIVE IMPACTS

6.1 Approach to cumulative impacts

The cumulative impact assessment approach involves considering the impacts of the project together with the impacts of other relevant future projects on economic activity. Relevant major projects within approximately 100 km of the project area with the potential for cumulative impacts with the project are identified in Table 6.1.

The cumulative impact of multiple projects in the region will see the magnification of impacts addressed in this report and competition for resources. These are discussed qualitatively below based on general principles of supply and demand and reference to available reports on cumulative impacts of regional projects.

Table 6.1 Significant Projects in the Region

Name	Type	Status	Distance from project (km)
Project EnergyConnect	Electricity transmission	Approved – under construction	0 – adjacent to boundary
Dinawan Wind Farm	Wind farm	Proposed – EIS in preparation	0 – adjacent to boundary
Argoon Wind Farm	Wind farm and BESS	Pre-SEARs - not in planning portal yet	0 – adjacent to boundary
Victoria to NSW Interconnect (VNI) West	Electricity transmission	Pre-SEARs - not in planning portal yet	0 – adjacent to boundary
Yanco Delta Wind Farm	Wind farm and BESS	Proposed – RTS submitted 21 Aug 2023.	1
Coleambally Solar Farm	Solar farm	Operating	30
Coleambally BESS	BESS	Approved – not constructed	30
Bullawah Wind Farm	Wind farm and BESS	Proposed – EIS in preparation. SEARs issued 12/12/2022.	38
Darlington Point Solar Farm	Solar farm and BESS	Operating	45
Woodland Battery Energy Storage System	BESS	Proposed – EIS on exhibition. SEARs issued 26/11/2021.	45
Yarrabee Solar Farm	Solar farm and BESS	Approved – not constructed. Approved December 2018. Last modified on 22 Nov 2021.	45
Billabong Creek Environmental Water Regulators	Water storage or treatment facilities	Proposed – EIS in preparation. SEARs issued 8 December 2022	50
Pottinger Wind Farm	Wind farm and BESS	Proposed – EIS in preparation. SEARs issued 20/07/2023.	60
Pottinger Solar Farm	Solar farm and BESS	Proposed – EIS in preparation. SEARs issued 10/07/2023.	60
Currawarra Solar Farm	Solar farm and BESS	Approved – not constructed. Approved 18/05/2018	60

Tarleigh Park Solar Farm	Solar farm and BESS	Approved – not constructed. Approved 18/05/2018	75
The Plains Solar Farm	Solar farm and BESS	Proposed – EIS in preparation. SEARs issued 23/12/2022.	90
The Plains Wind Farm	Wind farm	Proposed – EIS in preparation. SEARs issued 16/12/2022.	100

6.2 Potential cumulative impacts

6.2.1 Initial Cumulative Labour Stimulus

As of September 2023, there are 15 renewable energy generation projects of varying capacity proposed, approved or under construction in the immediate region (i.e. within approximately 100 km of the project area). The main cumulative economic impact of these projects (and other regional projects that are not related to energy) is to generate a large demand for a suitably qualified construction workforce in the region. This labour demand will be met from:

- the region:
 - the unemployment pool.
 - increased labour force participation.
 - workers from other industries.
- the rest of NSW and Australia, with labour:
 - moving into the region to live during the employment period; or
 - commuting from outside the region e.g. Fly-in-fly-out (FIFO) and Drive-in-drive-out (DIDO).

6.2.2 Population Impact

It is unlikely all the cumulative labour demand can be met from the existing residents of the region, only. To the extent that the cumulative job stimulus results in workers (and their families) relocating to regional areas, even temporarily, or workers from the region not emigrating from the region in search of work, this can provide population growth (or abate population decline), including in areas experiencing population decline. Trends in regional economies of NSW (because of globalisation and associated structural adjustment) has resulted in many non-coastal rural areas in NSW experiencing population decline. There has also been a decline in the population of smaller towns even in regions where the population has been growing.

Population growth is an important driver of the health of regional economies. Places that can attract population immigration create increased demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability (Sorensen, 1990). Conversely, population losses can contribute to a 'vicious cycle' of decline whereby reduced populations results in closure of services, which in turn makes it difficult to attract new populations (Sorensen 1990).

6.2.3 Accommodation Impacts

Cumulative regional population changes driven by cumulative regional employment growth will increase demand for short-term and long-term accommodation. The impacts can be increases in housing prices and rents, and shortages of short-term accommodation that might otherwise be used for tourism or other purposes.

From an economic perspective, increases in the cost of housing are predominantly a transfer between local owners and renters, or local owners and buyers. The existing homeowners and accommodation providers of the property benefit when this happens, and the renters/buyers lose (DAE, 2012). However, price rises also impact lower income households who may get squeezed out of the market. In situations where there are no market distortions, and cumulative population changes are longer term, the local housing supply would normally adjust to demand and prices return to their previous levels (DAE, 2012). However, given the more temporary nature of population change, normal longer term housing supply adjustments may be tempered and so there will be a need to encourage and facilitate the provision of additional accommodation including temporary workforce camps (such as the one proposed as part of this project), adaptive reuse or extension of existing buildings, use of existing granny flats and spare bedrooms, use of vacant housing etc.

The extent of residual housing price impacts for regional economies would depend on the balance of labour supply from inside the region, outside the region and DIDO/FIFO, the level of provision of workforce accommodation facilities from other projects within the region, and other accommodation options, as well as adjustment of the overall housing supply in response to increased demand. Early provision of additional accommodation can reduce housing price impacts.

6.2.4 Regional Job Growth

Cumulative demand for labour in regional areas can help address the jobs growth imbalance between Australia's biggest cities which have grown by an average of 2.4 per cent per annum since 2000 and the regions which have grown at 1.0 per cent per annum (Sobyra, 2022). This imbalance has been attributed to the economy creating relatively more demand for high skilled jobs than previously with the vast majority of these located in big cities rather than regions (Sobyra, 2022).

Regional jobs growth from the cumulative project demand can partly offset this trend by providing opportunities for the existing and future regional workforces, attracting middle-and high-skilled workers and families to regional areas, reducing outmigration of the regional workforce to look for employment in cities, and increase regional labour force participation. Regional projects can therefore provide a boom to non-coastal regional economies that have experienced low growth or decline because of globalisation and associated structural adjustment.

6.2.5 Stimulus to Regional Economic Activity

Cumulative projects in regional NSW will provide a substantial boost in direct economic activity in the region as well as flow-on economic activity to businesses that are able to supply the goods and services:

- required for project construction and operation; and
- demanded by workers i.e. expenditure of wages.

Based on the Economic Assessment in Sections 4 and 5, cumulative project construction is most likely to directly impact the heavy and civil engineering construction sector, construction services sector and non-residential building construction sector, and will indirectly impact a range of other sectors.

However, any business that can provide the goods and services demanded for project construction and operation, and by workers, will benefit from the cumulative economic activity.

6.2.6 Impacts on Other Sectors of the Economy

Notwithstanding the above, excess demand for construction workers can in the short run lead to increased construction sector (and other sector) wages, attraction of workers from other relevant sectors

of the economy leading to labour shortages in these other areas of the economy (and associated shortages of goods and services), rising inflation as firms pass wage costs onto consumers etc.

In addition, in the short run, excess demand for inputs to construction such as quarry materials, concrete etc can result in rising costs (prices) for these factor inputs and potentially shortages for other uses. The extent of these short run impacts for regional economies would depend on the balance of labour supply from inside the region, outside the region and DIDO/FIFO, as well as adjustment of the overall labour market, and other markets, in response to increased demand. However, in the medium term, markets will adjust to some extent (e.g. increased labour force participation, new quarry proposals to supply demand for aggregate etc) and enable wages and prices to return to previous levels.

Notwithstanding, any price increases and crowding out of other economic activities in the region represents the operation of the market system where scarce resources are reallocated to where they are most highly valued and where society would benefit the most from them. This reallocation of resources is therefore a positive thing for the economy not a negative. Notwithstanding, it may be associated with social impacts.

6.2.7 Agricultural Impacts

The economic assessment in sections 4 and 5 found that the negative regional economic impacts from the use of agricultural land for the project were very small, and small in comparison to the positive regional economic activity from the project. This finding reflects the small development footprint of the project and the lower value agricultural activity being impacted.

These findings are likely to be the same across most renewable energy generation projects. It is also noted that agricultural activities such as sheep grazing are expected to continue to some extent during project operations. The cumulative impact of projects on the regional economic activity of agriculture is therefore likely to be minor.

6.2.8 Mitigation Measures

The magnitude and duration of cumulative wage, price and supply shortages will largely depend on the ability of the labour, housing, and other markets to make supply adjustments.

Greater use of FIFO/DIDO and workforce accommodation will reduce impacts on the regional labour market (wage increases and labour shortages) and accommodation market (price/rent increases) but will also reduce regional economic activity benefits, because FIFO/DIDI workers will repatriate most of their income back to their home region.

The ability of the labour, housing, and other markets to make timely supply adjustments, may in some instances (e.g. housing supply adjustments, new quarry proposals) be impacted by local planning systems, and so Council's should be cognisant of the consequences of their decisions and the impacts of delays.

7 MITIGATION AND MANAGEMENT MEASURES

It is evident from Section 4 and 5 that the economic activity associated with the construction and operation of the project would outweigh the loss of economic activity from the minor and temporary impact on agricultural production. However, at the same time it would create a demand for a suitably qualified construction workforce in the region.

Spark Renewables proposes to work in partnership with Murrumbidgee Council and the local community to help maximise the projected economic regional benefits whilst minimising any impacts. In this respect, a range of general economic mitigation and management measures are proposed and would include:

- Employment of regional residents where they have the required skills and experience.
- Participating, as appropriate, in business groups, events or programs in the regional community.
- Locally sourcing non-labour inputs to production where local producers can be cost and quality competitive.
- Establishment of a Community Benefit Fund to be managed through a Voluntary Planning Agreement with Murrumbidgee Council.
- Lease payments to host landowners that provide an alternative drought proof income with potential flow-on benefits to the regional economy.

Agricultural activities are expected to continue during project operations and pre-project agricultural production will be reinstated following project decommissioning.

The Social Impact Assessment provides additional detail of management measures to be implemented.

8 CONCLUSION

The project will provide economic activity to the regional economy during both construction and operations. It would also result in a minor and insignificant contraction in regional economic activity from lost agricultural activity within the development footprint. These regional economic impacts were assessed using IO analysis.

The construction and operation of the project will have net positive impacts on the level of economic activity in the regional and NSW economy.

Spark Renewables proposes to work in partnership with Murrumbidgee Council and the local community so that, as far as possible, the benefits of the projected economic growth in the region are maximised and impacts minimised. In this respect, a range of general economic impact mitigation and management measures are proposed.

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ATTACHMENT 1 – THE GRIT SYSTEM FOR GENERATING INPUT-OUTPUT TABLES

The Generation of Regional Input-Output Tables (GRIT) system was designed to:

- combine the benefits of survey-based tables (accuracy and understanding of the economic structure) with those of non-survey tables (speed and low cost).
- enable the tables to be compiled from other recently compiled tables.
- allow tables to be constructed for any region for which certain minimum amounts of data were available.
- develop regional tables from national tables using available region-specific data.
- produce tables consistent with the national tables in terms of sector classification and accounting conventions.
- proceed in a number of clearly defined stages.
- provide for the possibility of ready updates of the tables.

The resultant GRIT procedure has a number of well-defined steps. Of particular significance are those that involve the analyst incorporating region-specific data and information specific to the objectives of the study. The analyst has to be satisfied about the accuracy of the information used for the important sectors. The method allows the analyst to allocate available research resources to improving the data for those sectors of the economy that are most important for the study.

An important characteristic of GRIT-produced tables relates to their accuracy. In the past, survey-based tables involved gathering data for every cell in the table, thereby building up a table with considerable accuracy. A fundamental principle of the GRIT method is that not all cells in the table are equally important. Some are not important because they are of very small value and, therefore, have no possibility of having a significant effect on the estimates of multipliers and economic impacts. Others are not important because of the lack of linkages that relate to the particular sectors that are being studied. Therefore, the GRIT procedure involves determining those sectors and, in some cases, cells that are of particular significance for the analysis. These represent the main targets for the allocation of research resources in data gathering. For the remainder of the table, the aim is for it to be 'holistically' accurate (Jensen, 1980). This means a generally accurate representation of the economy is provided by the table, but does not guarantee the accuracy of any particular cell. A summary of the steps involved in the GRIT process is shown in Table A1.1 (Powell and Chalmers, 1995).

Table A1.1**The GRIT Method**

Phase	Step	Action
PHASE I	1	ADJUSTMENTS TO NATIONAL TABLE Selection of national input-output table (1114-sector table with direct allocation of all imports, in basic values).
	2	Adjustment of national table for updating.
	3	Adjustment for international trade.
PHASE II	4	ADJUSTMENTS FOR REGIONAL IMPORTS (Steps 4-14 apply to each region for which input-output tables are required) Calculation of 'non-existent' sectors.
	5	Calculation of remaining imports.
PHASE III	6	DEFINITION OF REGIONAL SECTORS Insertion of disaggregated superior data.
	7	Aggregation of sectors.
	8	Insertion of aggregated superior data.
PHASE IV	9	DERIVATION OF PROTOTYPE TRANSACTIONS TABLES Derivation of transactions values.
	10	Adjustments to complete the prototype tables.
	11	Derivation of inverses and multipliers for prototype tables.
PHASE V	12	DERIVATION OF FINAL TRANSACTIONS TABLES Final superior data insertions and other adjustments.
	13	Derivation of final transactions tables.
	14	Derivation of inverses and multipliers for final tables.

Source: Bayne and West (1988).

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ATTACHMENT 2 – UNDERLYING ASSUMPTIONS AND INTERPRETATIONS OF INPUT-OUTPUT ANALYSIS AND MULTIPLIERS

1. "The *basic assumptions* in IO analysis include the following:
 - there is a fixed input structure in each industry, described by fixed technological coefficients (evidence from comparisons between IO tables for the same country over time have indicated that material input requirements tend to be stable and change but slowly; however, requirements for primary factors of production, that is labour and capital, are probably less constant).
 - all products of an industry are identical or are made in fixed proportions to each other.
 - each industry exhibits constant returns to scale in production.
 - unlimited labour and capital are available at fixed prices; that is, any change in the demand for productive factors will not induce any change in their cost (in reality, constraints such as limited skilled labour or investment funds lead to competition for resources among industries, which in turn raises the prices of these scarce factors of production and of industry output generally in the face of strong demand).
 - there are no other constraints, such as the balance of payments or the actions of government, on the response of each industry to a stimulus.
 2. The multipliers therefore describe *average effects, not marginal effects*, and thus do not take account of economies of scale, unused capacity or technological change. Generally, average effects are expected to be higher than the marginal effects.
 3. The IO tables underlying multiplier analysis only take account of one form of *interdependence*, namely the sales and purchase links between industries. Other interdependence such as collective competition for factors of production, changes in commodity prices which induce producers and consumers to alter the mix of their purchases and other constraints which operate on the economy as a whole are not generally taken into account.
 4. The combination of the assumptions used and the excluded interdependence means that IO multipliers are higher than would realistically be the case. In other words, they tend to *overstate* the potential impact of final demand stimulus. The overstatement is potentially more serious when large changes in demand and production are considered.
 5. The multipliers also do not account for some important pre-existing conditions. This is especially true of Type II multipliers, in which employment generated and income earned induce further increases in demand. The implicit assumption is that those taken into employment were previously unemployed and were previously consuming nothing. In reality, however, not all 'new' employment would be drawn from the ranks of the unemployed; and to the extent that it was, those previously unemployed would presumably have consumed out of income support measures and personal savings. Employment, output and income responses are therefore overstated by the multipliers for these additional reasons.
 6. The most *appropriate interpretation* of multipliers is that they provide a relative measure (to be compared with other industries) of the interdependence between one industry and the rest of the economy which arises solely from purchases and sales of industry output based on estimates of transactions occurring over a (recent) historical period. Progressive departure from these conditions would progressively reduce the precision of multipliers as predictive device" (ABS 1995, p.24).
- Multipliers indicate the total impact of changes in demand for the output of any one industry on all industries in an economy (ABS, 1995). Conventional output, employment, value-added and income multipliers show the output, employment, value-added and income responses to an initial output stimulus (Jensen and West, 1986).

Components of the conventional output multiplier are as follows:

Initial effect - which is the initial output stimulus, usually a \$1 change in output from a particular industry (Powell and Chalmers, 1995; ABS, 1995).

First round effects - the amount of output from all intermediate sectors of the economy required to produce the initial \$1 change in output from the particular industry (Powell and Chalmers, 1995; ABS, 1995).

Industrial support effects - the subsequent or induced extra output from intermediate sectors arising from the first round effects (Powell and Chalmers, 1995; ABS, 1995).

Production induced effects - the sum of the first round effects and industrial support effects (i.e. the total amount of output from all industries in the economy required to produce the initial \$1 change in output) (Powell and Chalmers, 1995; ABS, 1995).

Consumption induced effects - the spending by households of the extra income they derive from the production of the extra \$1 of output and production induced effects. This spending in turn generates further production by industries (Powell and Chalmers, 1995; ABS, 1995).

The *simple multiplier* is the initial effect plus the production induced effects.

The *total multiplier* is the sum of the initial effect plus the production-induced effect and consumption-induced effect.

Conventional employment, value-added and income multipliers have similar components to the output multiplier, however, through conversion using the respective coefficients show the employment, value-added and income responses to an initial output stimulus (Jensen and West, 1986).

For employment, value-added and income, it is also possible to derive relationships between the initial or own sector effect and flow-on effects. For example, the flow-on income effects from an initial income effect or the flow-on employment effects from an initial employment effect, etc. These own sector relationships are referred to as ratio multipliers, although they are not technically multipliers because there is no direct line of causation between the elements of the multiplier. For instance, it is not the initial change in income that leads to income flow-on effects, both are the result of an output stimulus (Jensen and West, 1986).

A description of the different ratio multipliers is given below.

Type 1A Ratio Multiplier = $\frac{\text{Initial} + \text{First Round Effects}}{\text{Initial Effects}}$

Type 1B Ratio Multiplier = $\frac{\text{Initial} + \text{Production Induced Effects}}{\text{Initial Effects}}$

Type 11A Ratio Multiplier = $\frac{\text{Initial} + \text{Production Induced} + \text{Consumption Induced Effects}}{\text{Initial Effects}}$

Type 11B Ratio Multiplier = $\frac{\text{Flow-on Effects}}{\text{Initial Effects}}$

Source: Centre for Farm Planning and Land Management (1989).

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