

**Commonwealth House of Representatives  
Standing Committee on Industry, Science and  
Resources**

**Developing Advanced Manufacturing in Australia**

Submission from the South Australian Government

March 2023



# South Australian Government Submission to the Developing Advanced Manufacturing in Australia Inquiry

## Introduction

The South Australian Government welcomes the inquiry into developing advanced manufacturing in Australia.

South Australia has many exciting opportunities for manufacturing growth, especially in a low carbon industrial future.

The transition of manufacturing since the 1960s when South Australia had relatively low-cost energy, land, and labour, through the 1980s with the global expansion of low-cost manufacturing, has required manufacturers to evolve to compete on high quality, design and innovation.

There are many international examples from which Australia can learn of countries that have reindustrialised and set their manufacturing industries on different growth trajectories, such as Singapore, Korea, Ireland, and Finland.

Like many parts of Australia, South Australia has abundant natural endowments, but in the absence of value-adding, the gains from unprocessed raw material exports are masking a decline in productivity. If manufacturing is to grow, it must be based on adding value to production through knowledge, entrepreneurship, advanced technologies, business models, and highly skilled people.

This submission highlights opportunities for manufacturing growth and investment, and the role of the Commonwealth in supporting enabling knowledge and economic infrastructure through mechanisms such as the National Reconstruction Fund.

## Manufacturing in South Australia

South Australia has 6,435 manufacturing businesses including 5,900 small, 500 medium, and 35 large-sized businesses. They contribute 25 per cent of business research and development, 20 per cent of exports, 7 per cent of employment, and 6 per cent of industry gross value-added to the State's economy.

Food and beverage manufacturing, machinery and equipment are the largest components of manufacturing in South Australia accounting for nearly half of all manufacturing, or 3 per cent of the state economy.

South Australia has the second largest share of manufacturing in its economy compared with other Australian states and compared with other industries in South Australia manufacturing has contracted from 9.7 per cent of industry gross value-added in 2011-12 to 6.3 per cent in 2021-22.

This is consistent with reduced manufacturing in Australia from 7.5 per cent to 5.8 per cent, and across most Organisation for Economic Cooperation and Development (OECD) nations over the same period, noting the OECD average is much higher at 13 per cent and many countries such as Germany and Finland have higher shares of manufacturing in their economies from 16 to 20 per cent.

These figures highlight the need for significant transition to ensure that manufacturing attains high productivity, and the opportunity to continue as a source of long-term economic growth is captured.

## Opportunities for Advanced Manufacturing

Manufacturing is known globally as an innovative, knowledge-intensive, value-adding capability that underpins 70 per cent of world trade. Having an advanced manufacturing capability underpins South Australia's ability to participate in the global economy, in the sectors of competitive advantage discussed later in this submission.

However, over the past two decades the challenges of the high Australian dollar in 2010, closure of automotive production in 2017, global health pandemic in 2020, and more recently the rise in competition for skilled workers has meant some industrial capabilities have been lost, particularly metal and engineering trades as well as higher level production engineering roles related to automation and systems integration.

With an increase in the renewable energy mix from 1 per cent to almost 70 per cent in 15 years, South Australia has developed an early advantage to decarbonise the economy, develop new connections into green global supply chains, and achieve net zero.

The role of manufacturing workers will evolve over the next decade as digital technologies become more widespread. People working alongside smart machines will create new opportunities for skilled careers in manufacturing including design, research and development, smart production, logistics, marketing, sales, and services.

## Global Trends

There have been significant shifts in the global environment in the last decade that have brought a new set of challenges and opportunities for manufacturers.

- **Climate** – at a time of growing international commitments to carbon abatement, Australia and South Australia have an advantage with the highest per capita wind and solar capacity among developed nations. Hydrogen and battery technologies will enable further development of the green energy sector and circular economy.
- **Society** – an ageing global population provides an economic opportunity to provide preventative and precision health to reduce global health budgets and deliver better health outcomes. An ageing population also presents an opportunity to tap into skills and experience from a workforce perspective.
- **Geopolitical** – the war in Europe, global health pandemic, and rise of cybercrime have all contributed to rising fossil fuel costs, supply constraints, inflation, and lower global economic growth. Defence and security spending, health solutions to future pandemics, and cyber security for businesses are all likely to increase over the next decade.
- **Digital** – digital technologies are disrupting every sector and require new approaches to creating business value through business models and workforce capability. From a manufacturing perspective, digital technologies have the potential to reduce Australia’s historical challenges of cost, scale, and distance to markets, and enable people to engage in creative and productive jobs.

## Competitive Strengths

Some of the state’s most prospective opportunities for manufacturing growth over the long-term are likely to be aligned with the following natural advantage sectors:

- **Renewable energy and green hydrogen** – national and international requirements for deep carbon emissions cuts are creating demand for innovative, low carbon products and technologies, waste infrastructure and end markets for recycled materials, in addition to the need for renewable energy as an input to production. South Australia’s world class renewable energy resources give the state a competitive edge in the race to supply clean, green, renewable hydrogen and to create green products that are often complex and high value.

South Australia has become a national leader over the past 15 years attracting \$6 billion in large-scale renewable energy and storage projects leading to an increase in variable renewable energy from 1 per cent to almost 70 per cent. South Australia has plans to achieve:

- 85 per cent renewable energy by 2025
- 100 per cent renewable energy by 2030
- halve total carbon emissions from all sectors by 2030
- net zero by 2050

The SA Hydrogen Jobs Plan is currently the most significant of several green hydrogen projects in Australia, not only as the largest, but also the first example of government resuming public ownership of a power infrastructure. It will lead to construction of 200 MW of power generation capacity using 250MWe of electrolyzers, and storage capacity of 3,600 tonnes of hydrogen. To be built in Whyalla the facility will provide firming and additional stability to the grid to improve the reliability of renewables and encourage further investment, particularly when delivered strategically with Port Bonython Hydrogen Export Hub and the Northern Water Supply projects. It is expected to reduce electricity prices by 8 per cent at a cost \$593 million and will be operational by the end of 2025.

- **Value adding to minerals and the circular economy** - as the world transitions to low-carbon technologies, large amounts of minerals and metals including direct reduction iron, steel, aluminium, silicon, lithium-ion, titanium, nickel, cobalt, zinc, graphene, vanadium will be needed, particularly in sectors such as energy, transport, and construction.

South Australia holds more than 69 per cent of Australia's copper and graphite resources, 80 per cent uranium, 27 per cent gold, and 11 per cent iron-ore. At present however there is little onshore value-adding, with the opportunity for manufacturing to add value to rare earth and critical minerals in a decarbonised, circular economy remaining relatively untapped.

In relation to electric vehicle batteries, despite a significant global increase of approximately 600 per cent to 2030, the International Energy Agency expects countries including Korea, Japan, China, the European Union, and United States to increasingly onshore battery production and recycling. While Australia accounts for 50 per cent of global lithium production and has 25 per cent of global reserves, it captures just 0.53 per cent of the value of its lithium ore exported and processed into electric vehicle batteries. Regions with cheap renewable electricity will have an advantage in the full supply chain from mine to battery. For example, China, produces 70 per cent of the world's electric vehicle batteries, however 50 per cent of grid power comes from coal. The global pursuit of 'green lithium' and 'green batteries' represents an opportunity for Australia.

- **Forestry and Timber** - with a focus on optimising fibre resources, diversifying into new markets, reducing carbon footprint, investing in science and innovation, and value-adding to local supply chains, forestry and timber is a key industry in South Australia's South-East that offers many new opportunities for manufacturing growth. The industry accounts for a third of Australia's locally produced house framing and interior sawnwood, and a quarter of particleboard.

Key drivers of growth include an anticipated four-fold increase in global fibre consumption by 2050, increased demand for new housing in Australia of 41 per cent by 2050 from 183,000 dwellings annually to 259,000, and new opportunities from the Commonwealth's plan to eliminate plastic waste by 2040.

Approximately 40 per cent of timber leaving the region is unprocessed, with manufacturing opportunities including biochemicals, value-adding to hardwood, generating new structural timber products, and creating new wood products to replace plastic.

The South Australian Government has committed \$2 million for a roadmap to strengthen the state's forest industries, domestic manufacturing and infrastructure capability, and \$15 million to establish a Forestry Centre of Excellence to deliver on these priorities.

- **Building and Construction** – with direct links to the forestry, timber, steel, cement, brick and other industries, the building and construction sector presents new opportunities for the manufacture of innovative products that support future low-carbon building systems and circular economy.

Key drivers of growth include a predicted doubling of the global built environment by 2060 with buildings of increasing complexity and higher environmental performance standards to support urbanisation and population growth. At present however the built environment generates 40 per cent of global CO<sub>2</sub> emissions, with concrete and steel (both manufactured in South Australia), and aluminium responsible for 23 per cent of global emissions. Achieving the Paris Agreement's 1.5°C target by 2050 will require new building materials such as fibre and cement composites, and low carbon construction processes enabled by advanced manufacturing and intelligent building information modelling.

- **Food and Beverage** – with nearly a third of all manufacturers, food and beverage is the largest manufacturing sector in South Australia. South Australia has a diverse food production sector processing primary products including meat, grains, dairy, seafood, fruit, vegetables and nuts which form the basis for a diverse range of food and beverage products.

South Australia is indisputably Australia's wine state, producing 50 per cent of Australia's bottled wine and about 80 per cent of premium wine, with nearly a billion bottles of South Australian wine on tables and in cellars around the world. Current opportunities are being explored to develop new products and expand to new markets, including high quality no and low-alcohol wines.

There are important challenges and opportunities for the sector in relation to food waste, traceability, high fat, salt and sugar (HFSS) foods, and packaging to continue access to high value markets, such as European markets. In addition, food production is responsible for a quarter of global greenhouse gas emissions, with food manufacturers increasingly required to demonstrate compliance with Environmental, Social and Governance (ESG) criteria to maintain international trade and exports.

There are significant opportunities to add value to South Australia's commodities, particularly value adding to grain, pulse and oilseed production and new opportunities such as hemp and seaweed, for a range of future uses including food, fibre, biofuels, chemicals and animal feed supplements.

- **Health and Medical** - South Australia has an emerging health manufacturing capability including medicines, vaccines, medical devices, pharmaceuticals, nutraceuticals, traditional medicines, biotech manufacturing and reagents.

South Australia also has strong medical research capabilities at the \$3.8 billion Adelaide BioMed City, Royal Adelaide Hospital, Flinders Medical Centre, Tonsley, and a high share of national medtech clinical trials at around 14 per cent.

The Australian Bragg Centre for Proton Therapy and Research will soon become Australia's first proton therapy centre and the first centre of its kind in the southern hemisphere. The Marine Bioproducts Cooperative Research Centre at Tonsley will develop a range of bioproducts over the next decade for the health, food, and chemical industries.

- **Defence and Space** - The Australian Space Park is set to become Australia's first dedicated space manufacturing hub and presents multiple opportunities for manufacturing complex and high-value products including small satellites, launch vehicles, ground-based subsystems, and related infrastructure.

In defence, understanding how to manufacture, integrate, upgrade, and apply new technology to submarines, surface ships, land vehicles, and aircraft are key future requirements. Primes are increasingly helping to develop local advanced manufacturing capability, with the BAE Systems and the Flinders University Factory of the Future at Tonsley an example.

The announcement of the new AUKUS submarines to be built in South Australia will provide significant manufacturing opportunities and jobs for generations of South Australians and provide a transformational opportunity to increase our economic complexity.

## Barriers to Growth

There are multiple barriers to growth, some of which are highlighted below:

- **green transition** – some manufacturers, particularly those with head offices in Europe, are setting renewable and carbon neutral targets by 2025 with penalties for non-compliance. Despite the state's high level of renewable energy, much of this is exported via the National Electricity Market with the benefits of renewable energy supporting net zero manufactured goods not flowing to local manufacturers, presenting risks for exporters in global markets.
- **workforce** – attracting and retaining a suitably qualified workforce is a challenge for many manufacturers. Gaps in some trades, particularly machinists, fabricators, polishers, fitters, turners and welders, an ageing workforce and competition for graduates will increasingly require a focus on lifting the perception of manufacturing as an exciting career opportunity. This needs to start in schools, and include fast-tracking migration for skilled workers, as well as better integrating vocational and higher education.
- **market opportunities** – the post-pandemic global trend of developing sovereign capability is negatively impacting the ability of some manufacturers to access global opportunities, effectively locking them out of global supply chains. With a relatively small domestic market this trend towards 'de-globalisation' is not an option for Australia. At the same time Europe is favourably considered by some manufacturers as offering new global supply chain opportunities in an increasingly complex geopolitical environment.
- **research and innovation** – many manufacturers perform research and development in-house, with limited external connections, and often without an appreciation of research related tax incentives. Many recognise the importance of research and development, however engaging with research institutions can be complex.
- **new technologies** – beyond the existing technologies commonly used by manufacturers, many smaller manufacturers have limited understanding of new technologies, including the capability of workers and capacity to adapt.
- **procurement** – South Australia is implementing reforms to make it easier for businesses to access government procurement, that involve early engagement with businesses in the design and tender specification stages, providing greater recognition of businesses that employ residents of South Australia, and Aboriginal businesses.

## Investment Opportunities

Foreign direct investment, co-investment, and public programs are critical for enhancing local manufacturing capabilities, opportunities for global supply development, the adoption of new technologies, improved enterprise management and workforce capabilities. As countries seek to rebuild their domestic manufacturing capabilities and supply chains, anchoring the benefits of foreign and public investment in Australia will become increasingly important. Critically, public investment at scale in enabling knowledge and physical infrastructure, is required to underpin Australia's industrial transition.

Mobilising the necessary resources to enable manufacturers to access patient capital, such as the Commonwealth \$15 billion National Reconstruction Fund, can support the development of future industries and enhance existing industries.

The National Reconstruction Fund (NRF) will finance projects that align with the seven priority areas of (1) renewables and low emissions technologies, (2) medical science, (3) transport, (4) value-add in the

agriculture, forestry and fisheries sectors, (5) value-add in resources, (6) defence capability, and (7) enabling capabilities.

With \$1 billion already allocated to 'advanced manufacturing, \$8 billion of the National Reconstruction Fund has been allocated to other priorities:

- up to \$3 billion for renewables and low emissions technologies
- \$1.5 billion for medical manufacturing
- \$1 billion for value-adding in resources
- \$1 billion for critical technologies
- \$1 billion for advanced manufacturing
- \$500 million for value-adding in agriculture, forestry, fisheries, food, and fibre.

It will be important to ensure that manufacturers can access funding across these multiple streams where there is a clear benefit to developing advanced manufacturing capabilities that close industrial gaps and increase economic complexity.

Opportunities for infrastructure investment that facilitates manufacturing growth needs to also be considered and supported by the Commonwealth Government. The NRF has been established to provide finance for projects that diversify and transform Australia's industry and economy, this should include the infrastructure required to enable transition to widespread access to low-cost renewable energy and efficient and sustainable use of scarce resources such as water. The full realisation of sustainable manufacturing growth requires participation by Australian manufacturers in global supply chains – this cannot be achieved or maintained without alignment with ESG principles and the global green transition.

The *Factory of the Future* at Tonsley is an excellent example of a world-class research facility that will modernise and transform manufacturing. The State Government has committed a total of \$9 million to establish the Line Zero industrial-scale testing facility and a Manufacturing Growth Accelerator as part of the *Factory of the Future* that will help at least 100 businesses strengthen their capabilities to enable them to participate in global supply chains, initially in the defence sector. Flinders University will contribute \$2 million to the initiative, and the Commonwealth has committed a further \$10 million to expand the *Factory of the Future*.

This aligns with approaches being taken by governments globally, who are introducing strategies to stimulate national and regional innovation capacity to improve their competitive positions in the technology and innovation-driven global economy. Some examples include Catapult Network (UK), Norwegian Catapult (Norway), Fraunhofer Institute (Germany), Flanders Make (Belgium), and TNO (Netherlands).

Enhancing management capability, including the deployment of Industry 4.0 technologies and business models, is critical for creating and capturing value in a high-cost business environment. For economies to become more advanced they must be capable of supporting first movers to design and develop new technologies, products, and processes. South Australia is developing a globally competitive advantage in several critical technology domains that can support manufacturing growth including:



- *Artificial Intelligence and Machine Learning* – can help manufacturers become more efficient in production, predictive maintenance, customer insights, and new product development.
- *Photonics and Sensors* – can help manufacturers develop specialty glass and optical fibres for defence, space, medical, agriculture, resource, and infrastructure sectors.
- *Robotics and Automation* – automation of tasks not previously possible, such as collaborative robots, augmented and virtual reality, and digital twinning.
- *Quantum Materials* – at the boundary of several engineering disciplines including quantum physics, material sciences, optoelectronics, and photonics with high value manufacturing opportunities in many sectors.
- *Biomanufacturing and Synthetic Biology* – creating of new biological systems and products that represent opportunities in areas such as mRNA vaccines, plant-derived pharmaceuticals, biofuels, industrial chemicals, and new yeast strains for wine, food, and beverage production.

The role of the Industry Capability Network to connect local businesses to major projects, reducing information gaps in the market and supporting the implementation of the *Australian Jobs Act 2013*, *Australian Industry Participation Plans*, and *Australian Industry Capability Program* is being evolved in South Australia to include mapping supply chains in new sectors such as hydrogen. This will identify capability gaps that will inform investment attraction and manufacturing capability building initiatives. For example, in hydrogen there is a known capability gap for the local supply of electrolysers, providing an opportunity to attract electrolyser manufacturing. There are many other sectors that would benefit from this approach, including defence, space, health, forestry, and construction. A national approach, assisted by the Commonwealth, to mapping domestic and international supply chains could provide new opportunities for local manufacturers to develop sovereign capability and enter global supply chains.

## Workforce

A highly skilled workforce is essential for manufacturing productivity, developing future industries, technologies and attracting investment, enhanced by manufacturers reinforcing the value of manufacturing as an exciting career destination that rewards ambition, innovation, and life-long learning.

In a manufacturing context, workers with science, technology, engineering, and maths skills will increasingly be required to create value from critical technologies, such as biomedical scientists, software engineers, cyber technologists, artificial intelligence scientists, digital product designers, renewable energy engineers, data technologists and decision scientists.

Equally important will be workers with business strategy, design, and management skills to capture the value created, such as chief innovation officers, business innovation managers, business strategists, business model designers, digital business analysts, and technology strategists.

Enhanced pathways from secondary education to vocational and higher education, together with new industry engagement models are key features of modern education systems to deliver jobs of the future.

The South Australian Government has commenced mapping future workforce needs and skills profiles in the defence and hydrogen sectors to ensure that industry, government, and the education sector have a clear understanding of industry workforce development needs, particularly for those roles identified as

critical to industry. A national approach could assist with identifying national manufacturing workforce needs and opportunities for national collaboration, including in regional areas.

## Closing

In closing, the South Australian Government welcomes the opportunity to provide a submission to this inquiry, highlighting the many opportunities for manufacturing growth and the important role of the Commonwealth in supporting enabling research and economic infrastructure. These will only be unlocked to their full potential if the investment, research, industry and workforce planning frameworks are genuinely collaborative with input from the Commonwealth and South Australian Governments, industry, universities and other research organisations.