Hi-Tech Sector Discussion Paper

Submission to Department for Innovation and Skills

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South Australian Chamber of Mines & Energy
The leading industry body representing the resources sector in South Australia

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1. Introduction

The South Australian Chamber of Mines and Energy (SACOME) is the peak industry body representing companies with interests in the South Australian minerals, energy, extractive, oil and gas sectors and associated service providers.

SACOME welcomes the release of the State Government's *Hi-Tech Sector Discussion Paper* (the Paper) seeking industry and academia's guidance in developing the *Hi-Tech Strategy 2030* to unlock new growth through investment, exports, innovation, collaboration and new jobs.

SACOME member companies are a cornerstone of the South Australian economy, with their combined activity generating the following key economic outcomes:

- 6.4 billion in production value.
- 50% of exports from South Australia, worth almost $5.8 billion, making it the highest value export sector in the State.
- $2.1 billion in Capital Expenditure investment in new mines and petroleum projects.
- Employment of 12,000 South Australians.
- $299 million in royalties to the South Australian Government.

(All data sourced from SARIG 2020)

This economic success reflects the South Australian resources sector underpinning innovation and providing the materials to drive economic growth and support a future Hi-Tech economy.

Despite these successes, the South Australian resources sector is often incorrectly characterised as an outdated industry. This stands in contrast to the reality of the resources sector being at the forefront of technological advancement.

In 2019 SACOME launched its 2024Vison[1] which maps a path for the future development of the South Australian resources sector, including its key objective of being recognised as an industry of the future.

The South Australian resources sector is a leader in innovation; an early adopter of technology; and continues to evolve as new skill sets emerge in areas of research, exploration, technology, logistics and production.

[1] https://www.sacome.org.au/2024-vision.html

Such examples encompass a junior explorer at a remote location; OZ Minerals developing their Carrapateena mine site; or BHP working on growth studies for a potential expansion of Olympic Dam. SACOME member companies are developing and using innovation to drive their operations.

This places the South Australian resources sector in a position to play a leading role in developing and growing the Hi-Tech sector in South Australia as:

- the South Australian resources sector provides the necessary scale of operations to facilitate the development of emerging industries and Hi-Tech products and services;

- South Australia's abundant minerals and petroleum reserves provides the scope to expand resources sector operations; to underpin emerging industries; and develop Hi-Tech products and services to facilitate this growth; and

- given the global operation of the resources sector, SACOME member companies can draw from a wide and deep pool of knowledge and skills to develop emerging industries and Hi-Tech products and services.

SACOME submits the "*Digital Innovation: Australia's $315B Opportunity*" report[2] commissioned by CSIRO's Data61 as an example of the importance of South Australia utilising its natural advantages to develop its own unique pathway to Hi-Tech success.

SACOME submits that the South Australian Government in developing the *Hi-Tech Strategy 2030*, should focus on:

- strategies to develop innovation as they key to increased productivity; and

- policies that improve and evolve existing industries while also developing new new industries.

SACOME remains committed to working collaboratively with the South Australian Government and all Hi-Tech sector stakeholders in developing a *Hi-Tech Strategy 2030* that advances economic growth outcomes leading to increased employment opportunities and greater prosperity for all South Australians.

[2] https://data61.csiro.au/en/Our-Research/Our-Work/Future-Cities/Planning-sustainable-infrastructure/Digital-Innovation

2. The South Australian Hi-Tech Sector

The South Australian economy faces unprecedented change as a result of globalisation and the increasing speed of technological advancement.

Innovation and an innovative mindset will be critical in transitioning the South Australian economy and delivering increased productivity and greater efficiencies.

The World Bank believes that increased urbanisation and the transition to a low carbon economy will increase the global demand for resources.

This increased global demand could potentially support expanding resources sector operations and project development in South Australia; underpin emerging industries; and the development and commercialisation of Hi-Tech products and services "spun out" of this economic growth.

2.1 Define the Hi-Tech Sector in South Australia

Government often touts "Hi-Tech" as an important source of growth and innovation but the danger in focusing on only "what is defined as Hi-Tech" can lead to missing out or undervaluing all the innovation and growth that is excluded by a narrow definition.

In the South Australian Government's *International and Interstate Engagement Bodies and Functions Review*[3], the Honourable Steven Joyce states:

> *"The hi-tech sector covers a range of companies in industries as diverse as professional services, fintech, medtech, cyber security, transport (autonomous vehicles), computer services and advanced manufacturing. It includes such technologies as the Internet of Things (IoT), edge computing, advanced data analytics, Artificial Intelligence (AI), machine learning, blockchain technologies, and 3-D printing."*

While the Federal Government's *Australia's Tech Future* paper[4] seeks to harness technological advancements to improve existing businesses, create new products and enhance daily life.

Neither Joyce nor *Australia's Tech Future* paper attempts to provide an all-encompassing definition of the Hi-Tech sector.

SACOME submits that the South Australian Government should be expansive in its definition of the "Hi-Tech sector" as business would be best served through a broad concept of innovation rather than relying on a fixed definition.

[3] https://www.dpc.sa.gov.au/__data/assets/pdf_file/0007/47887/South-Australian-Government-International-and-Interstate-Engagement-Bodies-and-Functions-Review.pdf
[4] https://www.industry.gov.au/sites/default/files/2018-12/australias-tech-future.pdf

Recommendation

- Provide a broad definition of the Hi-Tech sector as "any industry fostering, facilitating, using or involving advanced methods and/or the most modern equipment."[5]

2.2 Benefits of growing the Hi-Tech Sector in South Australia

The benefits of growing the Hi-Tech sector in South Australia are the opportunities it provides in boosting the South Australian economy and creating more highly skilled, high-paying jobs.

The Organisation for Economic Co-operation and Development (OECD) Employment Outlook 2019 analysis[6] of Australia outlines that 36% of Australian jobs face a significant or high risk of automation, meaning a sizeable share of adults will need to upskill or retrain to meet future job requirements.

In South Australia, technological advancements have already had a significant impact on industry and their deployment is increasing rapidly. A do-nothing approach to growing the Hi-Tech sector will not arrest the decline in South Australia's income, employment or population.

Further, the Data61 report indicates that digital innovation could deliver $315 billion in gross economic value to Australia by 2028. The effort by the South Australia Government to develop a Hi-Tech strategy is a positive step towards realising its share of this industry and grasping the opportunity presented by the State's comparative advantages.

A successful resources sector means a stronger South Australian economy with innovation the key to continuing this success.

Innovation and growing the Hi-Tech sector in South Australia will allow resources sector projects to expand and develop by reducing the cost of developing and operating assets; improving productivity and safety; and reducing risk.

In turn, this innovation gives rise to the potential of developing a product or service that can be exported for use across the globe or adapted for use in other industry sectors.

Recommendations

- Implement policies aimed at increasing the South Australian Hi-Tech sector market to above South Australia's national per capita share.

- Implement policies that fast-track the development and expansion of the South Australian resource sector to accelerate growth in the Hi-Tech sector.

[5] https://www.ldoceonline.com/dictionary/high-tech-industry
[6] http://www.oecd.org/australia/Employment-Outlook-Australia-EN.pdf

- Recognise and manage the concerns of the current workforce as the economy transitions and put in place policies that support the change in occupational requirements, including further investment in vocational education and training.

2.3 The Goals or Vision for the Hi-Tech Sector in South Australia

The Paper provides no pre-determined growth targets or vision for the South Australian Hi-Tech sector.

SACOME supports this "blank canvas" approach to encourage the creative thinking required to deliver the State's ambitious 3% year-on-year economic growth target.

SACOME submits that using the Datat61 report in aligning with *Growth State* to identify strategic areas for state growth will assist Hi-Tech sector development and establish future economic targets.

Recommendation

- Set an ambitious target of realising more than South Australia's per capita share of the potential $315 billion in economic value digital innovation will provide by 2028.

2.4 Key players in the Hi-Tech Sector

SACOME suggests the key players in the South Australia Hi-Tech sector are the State Government; industry; educational institutions and academia; and the community.

The South Australian Government through the *Hi-Tech Strategy 2030* must set long-term policies that work to boost the capability of the Hi-Tech sector; increase productivity and skills; create jobs; reduce red-tape and meet future needs.

Industry, including the South Australian resources sector, needs to increase its investment in innovation as a driver of productivity to translate technological developments into new opportunities.

Educational institutions must adapt their curriculums to ensure they are producing suitably qualified graduates equipped with the requisite skill sets to meet the changing needs of the future workforce; while commercialisation of technological developments should be prioritised as an academic outcome.

The development and adoption of new technologies is of fundamental importance. SACOME submits a shared collective mindset of innovation is as important as innovation itself.

3. Hi-Tech Opportunities

SACOME submits that the *Hi-Tech Strategy 2030* should provide equal weight to both the improvement and evolution of existing industries, and the growth of new industries as a means of better realising exponential growth opportunities.

Since 1840, the South Australian resources sector has a long history of innovation and advancing the boundaries of science.

This history and experience will serve the South Australian resources sector well in expanding and developing resources sector projects; and developing emerging industries and Hi-Tech products and services.

Future resources opportunities are presented by South Australia hosting:

- 80% of Australia's uranium resources;
- 80% of Australia's battery grade graphite resources;
- 68% of Australia's economic demonstrated resources of copper;
- 14 billion tonnes of identified iron ore resources; and
- Australia's largest onshore oil and gas province.

3.1 South Australian Resources Sector Hi-Tech Activity (1988-2020)

The following are some examples of historic Hi-Tech activity across the South Australian resources sector which demonstrates the sector as a leader in innovation.

AMIRA P260 Project

In 1988, UniSA partnered with AMIRA International to initiate the AMIRA P260 project[7], to help the resources sector improve the efficiency of the flotation process used to beneficiate a broad range of commodities from base and precious metals; rare earths; lithium; graphite; and other critical minerals essential for the Hi-Tech sector.

The project has examined hydrodynamics; surface chemistry; particles and bubbles interaction; and the use of spectroscopies and chemical probes.

The project has increased the recovery and/or grade of minerals; optimised their price; reduced operating costs; and delivered more than $1 billion to the mineral resources sector, representing a 22:1 return on the investment of more than 100 industry sponsors.

In its 32nd year of continuous industry support, the AMIRA P260 project has been recognised by the EU Commission on University-Business Co-operation as an exemplar Case Study.[8]

[7] https://www.unisa.edu.au/research/impact-stories/better-way-to-process-minerals/
[8] https://www.ub-cooperation.eu/pdf/cases/I_Case_Study_Amira_P260.pdf

Exploration and Mining Software (EMS)

The EMS sector is an innovative and important segment of Australia's $90 billion Mining, Equipment, Technology and Services (METS) industry; and according to Austrade generates more than $600 million a year of mining related revenues; more than $240 million of exports; and directly employs more than 2500 people.

Leading EMS sector firm Zonge Engineering and Research Organization Pty Ltd are based in South Australia. South Australian companies account for 6% of the total EMS sector.

The Australian EMS sector has matured rapidly over the past decade, fostered by the resources sector boom and highlights the importance of the sector in producing Hi-Tech products and services.

Heap Leaching

Heap leaching works by drip-feeding acid through a large stockpile (or heap) of ore to leach out metals. BHP uses heap leaching at its copper operations in Chile, however Olympic Dam's polymetallic properties require a different approach which has resulted in innovation in this recovery technique by BHP.

BHP has successfully completed its heap leach research and development (R&D) trial in South Australia, confirming the viability of the technology to extract copper, uranium, gold and silver at Olympic Dam.[9]

The program began in 2012 and was conducted at a purpose-built, small-scale heap leach facility at Wingfield run by Bureau Veritas, under direction from BHP and with support from the South Australian Government.

The R&D program could benefit the mining industry more broadly in South Australia, as heap leaching has the potential to deliver lower capital and operating costs; increased scalability; reduced potable water use; and the ability to process lower-grade ores.

3.2 Existing Industry Opportunities

The following are some examples of existing Hi-Tech activity across the South Australian resources sector that could deliver long-term growth in the Hi-Tech sector.

Modern Exploration Techniques

The Data61 report highlights that applying machine learning techniques and greater automation to improve the efficiency of resources sector discovery and production could increase Australia's global market revenue to $25-40 billion by 2028.

[9] https://www.bhp.com/community/community-news/2019/06/bhp-completes-heap-leach-technology-trial-for-olympic-dam/

South Australia's geological challenge is that the next generation of Tier 1 deposits are hidden under deep cover. South Australia must focus its geoscience effort on providing the knowledge base and technology that will substantially increase the success rate of mineral exploration.

Open innovation platform Unearthed has the largest community of data scientists, developers and start-ups solving the challenges of the energy and resources sector industry.

OZ Minerals and Unearthed partnered to launch the Explorer Challenge[10] calling for geologists and data scientists to develop ground-breaking approaches to discover new exploration targets near OZ Minerals' Prominent Hill copper-gold mine, with a $1 million prize pool.

The Explorer Challenge resulted in 1000 + individual registrations from over 60 countries; 10,000 downloaded data sets; 20 teams applying machine learning; and over 400 potential exploration targets being identified.

Some of OZ Minerals learnings from the Explorer Challenge[11] are more open data will yield better models in a much shorter time frame; sharing hard problems will produce better solutions; and growing a distributed and diverse expert community in exploration will build better relationships between industry, communities and government.

The deployment of open data and machine learning applications has the potential to increase the speed and success rates of economic discoveries in the resources sector. Better targeted drilling will increase resources sector operators' output and reduce costs.

SACOME also welcomes the recent announcement by the Department of Energy and Mining (DEM) of its partnership with Unearthed to launch ExploreSA: The Gawler Challenge[12], focused on uncovering new targets in the State's highly prospective Gawler Craton region.

Recommendation

- The *Hi-Tech Strategy 2030* should align its policies and strategies with the Accelerated Discovery Initiative and ExploreSA: The Gawler Challenge; and fund exploration incentives that support innovative techniques to overcome the geological barriers to increased exploration in South Australia.

Big Data Analytics

SACOME submits the following as two examples of big data analytics:

[10] https://www.ozminerals.com/media/news/oz-minerals-partners-with-unearthed-on-explorer-challenge/
[11] https://www.ozminerals.com/uploads/media/AIG_Presentation_Brisbane_-_Final.pdf
[12] https://d3n8a8pro7vhmx.cloudfront.net/liberalpartyofaustralia/mailings/3168/attachments/original/11-29_Explore_SA.pdf?1574922671

Conditioning seismic data for predictive modelling of reservoir properties and well optimisation

Seismic data provides a very large spatial dataset and can be calibrated at data points where wells penetrate, providing data sources of different resolution, accuracy and uncertainty.

Utilising advanced data analysis allows for the detailed high resolution well data to be extrapolated across a large area to model the larger subsurface and to inform future exploration and development wells.

Senex Energy's initial work undertaken in this space is encouraging and will be expanded across a larger area of their operations.

Big Data analysis for reservoir characterisation and production forecasting

This is an extension of Senex Energy's work in seismic conditioning, to identify all the key performance drivers and target under-performing wells for potential intervention.

Recommendation

- Implement policies that support the development of big data technologies to transform and increase productivity across a wide range of existing industries.

Cloud Base Technologies

Senex Energy has deployed a cloud-based petro-technical platform that enables remote working and access to significant computing power, without a significant outlay to maintain hardware.

Senex was one of the first companies in the world to test this solution and to deploy the technology. Currently the technology is focussed on remote desktop capability but in the longer-term will facilitate big data analytics to inform better understanding of the subsurface dataset and highlight missed opportunities.

Recommendation

- Implement policies that support the development of cloud base technologies to transform and increase productivity across a wide range of existing industries.

Carbon Capture Storage

Carbon capture and storage (CCS) is the process of capturing and storing carbon dioxide (CO_2) before it is released into the atmosphere. The technology can capture up to 90% of CO_2 released by electricity generation and industrial processes such as cement production.

The CO_2 is captured, compressed into a liquid state and transported by pipeline, ship or road tanker. The CO_2 can then be pumped underground to be stored in depleted oil and gas reservoirs, coalbeds or deep saline aquifers where the geology is suitable.

Santos has been investigating the feasibility of a project to capture vented CO_2 from the Moomba Gas Plant to enhance oil production in the Cooper Basin.

In their recent Climate Change Report 2020[13] Santos indicated that it plans to capture 300,000 tonnes of CO_2 emissions per annum from the Moomba Gas Plant; and compress, dehydrate and transport to a target field nearby for injection.

Santos has stated with the "*right policy settings and incentives to accelerate the CCS deployment, the Copper Basin could become a large scale, commercial CCS hub capturing emissions from oil and gas but also from other industries such as power generation*."

Recommendation

- Implement policies and incentives to support the development of commercial CCS hubs.

Electric Vehicles

Olympic Dam relies on a team of approximately 800 underground employees using diesel equipment for development; production; ore handling; and mine services.

In mid-2018, BHP introduced its first ever light electric vehicle (LEV), powered by lithium ion batteries to join its existing underground fleet of 240 light vehicles. Adoption of LEVs aims to reduce employees' exposure to the diesel particulate matter generated by traditional diesel engines.[14]

Olympic Dam's potential switch to LEVs in its operations will reduce emissions, exposure and costs as well as influencing the rollout of similar initiatives in other locations.

Recommendation

- Implement policies and incentives to support the development and adoption of electric vehicles in industrial fleets.

Renewable Technology

Santos aims to reduce its production emissions by converting its oil well operations in the Cooper Basin to 100% renewable energy.[15]

[13] https://www.santos.com/wp-content/uploads/2020/02/2020-climate-change-report.pdf
[14] https://www.bhp.com/community/community-news/2018/06/light-electric-vehicles-make-their-bhp-debut/
[15] https://www.santos.com/media-centre/announcements/santos-rolls-out-renewable-energy-in-the-cooper-basin/

After a successful pilot program, 20 out of 56 sites have been converted with 1.2MW of solar panels and more than 2MW of batteries, in the next step towards commercialising this technology.

The solar and battery combinations were sized to ensure continual operation 24 hours a day in some of Australia's harshest climates, a world-first in creating a fully autonomous, off grid solar and battery system.

If all 200 sites are converted, Santos will save about 140 barrels of oil a day currently used to power the pumps, yielding significant environmental and operational cost benefits.

Recommendation

- Implement policies and incentives to support the development of autonomous, off-grid solar and battery systems.

Mineral Beneficiation

Mineral beneficiation is a process by which valuable constituents of an ore are concentrated by means of a physical separation process, to prepare the ore prior to downstream purification processing.

Researchers at the University of South Australia will partner in the $48 million ARC Centre of Excellence for Eco-Efficient Beneficiation of Minerals led by the University of Newcastle to develop new technologies and improved techniques to extract and process minerals; reduce water and energy usage; and minimise waste.[16] [17]

Increased energy and water efficiencies will reduce operating costs for resources sector operators.

Recommendation

- Implement policies and incentives to support further mineral beneficiation research.

In Situ Recovery Techniques

In situ recovery (ISR) refers to the recovery of valuable metals from ore deposits by circulating fluid underground and recovering the valuable metal at the surface for further processing.

ISR has been commonly used in Australia for mining uranium, and in large scale operations across the globe for mining potash, salt, uranium and copper. Interest in ISR is increasing due to geophysical, infrastructure and mineralogy challenges increasing

[16] https://fii.unisa.edu.au/newsroom/future-mining--smarter-greener-and-essential-to-innovation/
[17] https://coeminerals.org.au/

capital and operating costs for resources sector operators rendering their deposits uneconomical.

ISR has the potential to reduce the size and disruption of projects and avoid the creation of pits, dumps and tailing dams resulting in reduced operating costs and improved environmental outcomes.

Environmental Copper Recovery has received a $2.85 million Cooperative Research Centre (CRC) program grant for its Kaunda ISR project. The research, in conjunction with the University of Adelaide's Institute for Mineral and Energy Resources and CSIRO's Minerals and Land and Water Divisions will analyse the economic, environmental and social impacts of ISR.

Recommendation

- Implement policies and incentives to support further in situ recovery research.

Steel Production

The resurgence of the Whyalla Steel Mill with the introduction of "Greensteel" production, using recycled scrap metal as a feedstock for plants, and powering them with renewables is the result of innovation and the attraction of international investment.

In the longer-term, GFG plans for a 'next-generation' mega steel plant designed to produce 10 million tonnes per year focused on the production of semi-finished steel exported to downstream operations in key strategic and growing markets around the world.[18]

Recommendation

- The development of a framework that facilitates the expansion of the Whyalla Steelworks and increased "Greensteel" production.

Hydrogen Production

Domestic hydrogen use could accelerate the development of large-scale energy storage in South Australia. The coupling of gas, electricity and transport sectors could create wider benefits for the community and industry, with increased efficiencies and more flexibility.

This technology has significant potential benefit to a range of South Australian industries through improved fuel security and decarbonisation, hydrogen offers a potentially valuable fuel source for remote resources sector operations.

[18] https://www.gfgalliance.com/media/sanjeev-gupta-announces-visionary-next-gen-mega-steel-plant-for-whyalla/

Recommendation

- Implement policies that facilitate hydrogen production and closely aligns to Australia's National Hydrogen Strategy and South Australia's Hydrogen Action Plan.

Nuclear Industry

A key finding of the Nuclear Fuel Cycle Royal Commission was that the provision of a secure, reliable and safe location for spent nuclear fuel could provide up to $455 billion in a State Wealth fund.

SACOME recognises the development of a nuclear industry is politically challenging. However, significant work has been undertaken to quantify the opportunity and excluding it artificially narrows growth options for the Hi-Tech sector.

Recommendation

- Support the development of a South Australian nuclear industry.

Value-adding and Industrial Hubs

SACOME's *Sustainably Growing Energy and Mining* submission[19] advocates for the development of "value-adding" activities such as smelting, refining and manufacturing to move South Australian commodities to a higher price point for interstate and international export.

The development of industrial hubs in suitable areas of the State presents an opportunity to concentrate this value-adding activity, minimise the duplication of critical minerals and infrastructure and create a user-base with enough critical mass to justify development/expansion of multi-modal export infrastructure.

Attaching Hi-Tech firms to these industrial hubs where Hi-Tech labour skills are also available will encourage further clustering with links to suppliers, services and "spin-off" start-ups from the industrial hub.

Recommendation

- Facilitate the development of "value-adding" activities; and industrial and Hi-Tech hubs.

Predictive Maintenance

Predictive maintenance helps determine the condition of in-service equipment and the right time to perform maintenance.

[19] https://www.sacome.org.au/uploads/1/1/3/2/113283509/sacome_growing_energy___mining_in_sa_submission_november_2019_final_1.pdf

One of the most efficient predictive maintenance techniques is to combine heterogeneous data from a company's operating process, automation system and other on-site analysis to form a solution.

Predictive maintenance optimises asset management, reduces energy consumption and prevent future failures of industrial equipment (reducing downtime and maintenance cost).

PREDICT[20], is currently deploying its predictive maintenance solution in different sectors including resources, energy, defence and space sectors.

Recommendation

- Implement policies that support the awareness and deployment of predictive maintenance technologies.

3.3 Emerging Industry Opportunities

The South Australian Government has often touted South Australia's potential to develop Health Care; Electric Vehicle (EV); Defence; Renewable Technology; and Space industries.

SACOME supports these endeavours to diversify the economy and highlights that the South Australian resources sector produces may of the resources required to support their development.

The following are some examples of how the South Australian resources sector could support the development of these emerging industries and help grow the Hi-Tech sector.

Health Care Industry

Metal-based compounds are crucial to the diagnosis and treatment of disease. Copper kills surface microbes and reduces infections; and it is used in electronic devices. Uranium is used in cancer treatments and radiation therapy.

The nanotechnology boom has opened up a new frontier of early detection, diagnosis and treatment of diseases. Gold nanoparticle technology is being used to target and deliver antibodies directly into cancerous tumours.

Gold nanoparticle technology is also being engineered to attach cancer-related proteins to aid earlier detection.

[20] https://www.predict.net.au/

EV Industry

The South Australian Government is expected to release its EV strategy in 2020 as one of its top priorities. A theme of the South Australian Government's EV strategy consultation paper[21] was that the transition to EV provides new industry development and employment opportunities across the value chain.

This could include local assembly or outright manufacture of new EVs, manufacturing of key components and related infrastructure; R&D; skills; training and workforce opportunities.

The resources sector can underpin the development of the EV industry in South Australia as:

- the car body and chassis of an EV requires iron, manganese, vanadium, molybdenum, aluminium and magnesium;
- EV batteries require lithium, cobalt, nickel and carbon;
- magnets in EV motors require dysprosium and neodymium; and
- copper is required for the connectors, brakes and bearings.

Defence Industry

The South Australian defence industry has proven capability and experience in delivering many of Australia's largest and most complex defence projects.

South Australia is home to the headquarters of seven of the world's top ten major defence companies; and a strong core of specialist SMEs, with defence industry capabilities.

The resources sector is well placed to expand with the defence industry, given South Australia is highly prospective for manganese which is required for batteries, ship building and jet engines.

Renewable Technology Industry

The South Australian Government is committed to maximising the economic and job opportunities associated with renewable technology.

[21] https://rdahc.com.au/wp-content/uploads/2019/07/Electric-Vehicle-Strategy-for-South-Australia_July2019_RDA-AHFKI.pdf

Solar Panels and PV Solar Recycling

South Australia has a well-developed rooftop solar PV industry, with about one in three households having solar PV panels and these numbers are increasing.

Copper, silicon, silver and zinc are the four major minerals for the manufacture of solar panels and its various components.

SACOME has made calls in our 2019-20 and 2020-21 pre-budget submissions for the State Government to investigate establishing a scheme that provides South Australian households and small businesses with access to free industry-funded collection and recycling services for solar panels.

Such a scheme could reduce waste to landfill, especially hazardous materials found in e-waste; increase recovery of reusable materials in a safe, scientific and environmentally sound manner; and provide access for households and small businesses across Australia to an industry-funded recycling service.

SACOME submits that this could create a new industry and further employment opportunities within the recycling sector.

Batteries and the Battery Circular Economy

South Australia hosts 80% of Australia's battery grade graphite resources and has large quantities of lithium and cobalt. South Australia is also highly prospective for manganese and nickel.

These resources are elements in alkaline batteries used in toys and electronics; and lithium-ion batteries used in mobile phones and battery energy storage.

Australia also has low battery recycling rates. 95% of cobalt, lithium and graphite in batteries can be reused.

SACOME submits this provides South Australia with the chance to establish an economy in the re-use and recycling of batteries and the opportunity to draw additional value from existing materials; whilst minimising the impact on the environment.

Wind Farms

South Australia has attracted significant large-scale renewable energy investment, with currently over 1,800 MW in installed capacity in wind farms in South Australia.

There are many components to a wind turbine. Magnet generation and the steel used for the turbine needs iron; the wind turbine controls need copper.

This provides South Australia with the opportunity to establish a supply chain in wind farm manufacturing.

Space Industry

The State Government has earmarked the space industry as an emerging industry in South Australia.

The South Australian Space Industry Centre (SASIC) was established to drive space industry innovation, research and entrepreneurial development. SASIC's main capabilities and expertise will be concentrated on earth observation; satellite communications; and space-based position, navigation and timing.

South Australia's abundant mineral resources can underpin technological advancements in rocket engines (copper) and energy sources for vehicles like the Mars Rover (uranium). These space-enabling services support activities across a variety of sectors including communication, environmental monitoring and mapping.

Developing Industry Opportunities Recommendations

- Implement policies that support increased production of South Australian minerals necessary to facilitate the advancement of the Health Care; EV; Defence; Renewable Technology; and Space industries in South Australia.

- Link the South Australian resources sector with manufacturing of Health Care; EV; Defence; Renewable Technology; and Space industries products and services.

- Develop an economic supply chain for these emerging industries in South Australia.

- Develop a PV Solar recycling scheme.

- Develop an economy in the re-use and recycling of batteries.

4. Key Challenges

The *Hi-Tech Strategy 2030* needs to address the following challenges if South Australia is to fully realise the opportunities in developing a Hi-Tech sector:

- bi-partisan support for the continuity of research funding as the key to innovation and commercialisation;
- increased industry investment into R&D; and greater emphasis by industry and academia to commercialise ideas;
- the implementation of the digital infrastructure required to connect people and places; improve productivity; increase economic growth; and improve sustainability; and
- mapping future workforce requirements, skills development and talent attraction.

SACOME is committed to working collaboratively with the State Government and all Hi-Tech sector stakeholders to address these barriers to development of the sector.

4.1 Barriers to R&D collaboration between researchers and industry

The barriers in R&D collaboration between researchers and industry can be broken down into two categories: structural and cultural.

Structural Barriers

Continuity is the key to innovation. Jurisdictions outside of Australia have put policy in place to support continuity in their innovation sector.

For example, in Germany the Science Council and the German Research Foundation are key decision-makers for policy and funding outcomes.

Germany has 270 collaborative research centres that are funded by the German Research Foundation for up to 12-year periods, which allow researchers to commit to complex, long-term, multidisciplinary projects across universities and institutes.

By way of contrast, the Australian experience comprising of constant changes to budgets and funding make allocation to projects difficult and threaten the longevity of research collaboration. This puts pressure on research to be completed within the two to four-year funding cycle that is rarely enough time to complete a project and seek commercialisation.

As a result, many Australian scientists prefer to work overseas, culminating in a significant expertise gap in the management of development of a prototype to commercialisation in Australian institutions.

SACOME emphasises the need for bi-partisan and long-term support of the Hi-Tech sector.

Recommendations

- Establish a Government innovation fund to support the commercialisation of technological advancements across the identified growth sectors.

- Establish an Innovation Council led by industry and academic leaders to develop a cohesive research framework and to administer the innovation fund to ensure the ongoing support of collaborative innovation hubs.

Cultural Barriers

Australia trails other developed countries in relation to investment into R&D, with industry led investment lagging behind.

Career advancement for academics is linked to publications of papers, creating an unhealthy competitive environment among researchers; and discouraging scientists from pursuing riskier but potentially productive areas of research.

The OECD Science, Technology and Industry Scorecard 2017[22] places Australia last out of 28 nations on the measure of business and research collaboration behind countries like Greece, Estonia and Chile.

The differing cultures, motivations and drivers of industry and academia pose a large obstacle to effective collaboration.

To ensure continued economic growth South Australian industry and academia need to place greater value on the commercialisation of ideas; innovation or research as a key driver of new sources of revenue, jobs and industries.

Recommendations

- Better align industry and academic R&D opportunities to foster a culture of collaboration, innovation and commercialisation relevant to Hi-Tech sector development;

- Government to implement a policy mandating a dedicated percentage of departmental budgets towards innovation and collaboration with research hubs.

- Government and industry to establish "disruption units" within their business to accelerate disruption in their area of operation.

[22] https://www.oecd-ilibrary.org/sites/9789264268821-en/index.html?itemId=/content/publication/9789264268821-en

4.2 Challenges to growing the Hi-Tech Sector in South Australia

Digital Infrastructure

The implementation of digital infrastructure should be a priority for Government.

Reliable and fit-for-purpose mobile and fixed phone and broadband services are critical for the community to access everyday services.

Digital infrastructure also includes location-based technologies such as GPS that drives the development of Hi-Tech products and services.

Recommendations

- Expand Gig-city throughout South Australia and to residential customers.
- Establish a South Australian Government Mobile Black Spot program to eliminate the 500 mobile black spots registered in South Australia.

4.3 South Australian Resources Sector Hi-Tech challenges

Energy Challenges

Energy affordability and reliability is a key input for resources sector projects and goes directly towards project viability. It must be a strategic policy priority if growth targets are to be realised.

SACOME members support the idea of consolidating the development of renewable energy generation projects in line with renewable energy zone and industrial hub concepts as a means of better developing economies of scale for supply of renewable energy to industry.

Consideration should also be given to the energy requirements of upstream processing/value-added activity such as smelting and manufacturing as this will require a reliable supply of power to be available at a competitive price.

Recommendation

- The South Australian Government to improve certainty of investment in generation projects and ensure energy reliability and affordability for resources sector and C&I operators.

Water Challenges

Water is a key challenge for resources sector projects in South Australia. Given the importance of water as an input, serious consideration must be given to its availability and transmission to project sites as a prerequisite for achieving growth targets.

It is also important to emphasise that water is a contested resource given its importance to many industry sectors, community and the environment.

SACOME also notes the importance of water to hydrogen production and suggests that an industrial water strategy should also consider requirements for the development of a South Australian hydrogen industry.

Recommendation

- SACOME reiterates its 2020-21 pre-budget submission call for the development of a State Industrial Water Strategy to consolidate understanding and provide solutions to meet the water requirements of South Australian resources projects.

Skills Development and Talent Attraction

The resources sectors' transition from a traditional labour-intensive workforce towards a professional workforce needs greater collaboration between government, industry and educational institutions to understand, manage and develop educational outcomes that will facilitate future workforce requirements.

SACOME submits that current attraction strategies will need to be revised to meet near and long-term needs and anticipating future workforce requirements will be important in realising *Growth State* objectives.

SACOME has been proactive in this space, partnering with the Playford Trust and the South Australian Government to fund scholarships for students enrolling in mining and petroleum engineering at the University of Adelaide over the next five years.

Ongoing effort must be made to coordinate workforce needs for the South Australian resources sector. SACOME submits that collaborative effort by government departments, educational institutions and industry to define the current challenges and set clear future direction would lay foundations for a strategic approach to addressing the respective needs of stakeholders.

SACOME calls on the State Government, resources operators and educational institutions to engage in collaborative mapping of future workforce requirements for resources projects in South Australia.

Recommendation

- SACOME calls for funding to DEM, DIS, the Department for Education, industry and other relevant entities for collaborative mapping of future skillsets required by the resources sector to better align education and training outcomes with future workforce requirements.

5. Conclusion and Summary of Recommendations

SACOME welcomes the opportunity to make this submission to the Hi-Tech Sector Discussion Paper consultation process.

SACOME member companies are leaders in innovation; and early adopters of technology and as a result well placed to advise on the development of *Hi-Tech Strategy 2030*.

SACOME's 2024Vision has a strong focus on being recognised as an industry of the future. It is important for the South Australian resources sector to be recognised as an instigator of innovation.

SACOME and its member companies understand the importance of innovation to the State's economy; retaining our most talented minds; and the positive impact it has on communities and the environment.

SACOME remains committed to working collaboratively with the South Australian Government and other industry sectors in advancing economic growth outcomes for the State via the *Hi-Tech Strategy 2030*.

Summary of Recommendations

Section 2 – Hi-Tech Sector

- Provide a broad definition of the Hi-Tech sector as "any industry fostering, facilitating, using or involving advanced methods and/or the most modern equipment.
- Implement policies aimed at increasing the South Australian Hi-Tech sector market to above South Australia's national per capita share.
- Implement policies that fast-track the development and expansion of the South Australian resource sector to accelerate growth in the Hi-Tech sector.
- Recognise and manage the concerns of the current workforce as the economy transitions and put in place policies that support the change in occupational requirements, including further investment in vocational education and training.
- Set an ambitious target of realising more than South Australia's per capita share of the potential $315 billion in economic value digital innovation will provide by 2028.

Section 3 – Potential Hi-Tech Opportunities

- The *Hi-Tech Strategy 2030* should align its policies and strategies with the Accelerated Discovery Initiative and ExploreSA: The Gawler Challenge; and fund

exploration incentives that support innovative techniques to overcome the geological barriers to increased exploration in South Australia.

- Implement policies that support the development of big data technologies to transform and increase productivity across a wide range of existing industries.
- Implement policies that support the development of cloud base technologies to transform and increase productivity across a wide range of existing industries.
- Implement policies and incentives to support the development of commercial CCS hubs.
- Implement policies and incentives to support the development and adoption of electric vehicles in industrial fleets.
- Implement policies and incentives to support the development of autonomous, off-grid solar and battery systems.
- Implement policies and incentives to support further mineral beneficiation research.
- Implement policies and incentives to support further in situ recovery research.
- The development of a framework that facilitates the expansion of the Whyalla Steelworks and increased "Greensteel" production.
- Implement policies that facilitate hydrogen production and closely aligns to Australia's National Hydrogen Strategy and South Australia's Hydrogen Action Plan.
- Support the development of a South Australian nuclear industry.
- Facilitate the development of "value-adding" activities; and industrial and Hi-Tech hubs.
- Implement policies that support the awareness and deployment of predictive maintenance technologies.
- Implement policies that support increased production of South Australian minerals necessary to facilitate the advancement of the Health Care; EV; Defence; Renewable Technology; and Space industries in South Australia.
- Link the South Australian resources sector with manufacturing of Health Care; EV; Defence; Renewable Technology; and Space industries products and services.
- Develop an economic supply chain for these emerging industries in South Australia.

- Develop a PV Solar recycling scheme.

- Develop an economy in the re-use and recycling of batteries.

Section 4 – Key Challenges

- Establish a Government innovation fund to support the commercialisation of technological advancements across the identified growth sectors.

- Establish an Innovation Council led by industry and academic leaders to develop a cohesive research framework and to administer the innovation fund to ensure the ongoing support of collaborative innovation hubs.

- Better aligning industry and academic R&D opportunities can foster a culture of collaboration, innovation and commercialisation relevant to Hi-Tech sector development.

- Government to implement a policy mandating a dedicated percentage of departmental budgets towards innovation and collaboration with research hubs.

- Government and industry to establish disruption units within their business to accelerate disruption in their area of operation.

- Expand gig-city throughout South Australia and to residential customers.

- Establish a South Australian Government Mobile Black Spot program to eliminate the 500 mobile black spots registered in South Australia.

- The South Australian Government to improve certainty of investment in generation projects and ensure energy reliability and affordability for resources sector and C&I operators

- SACOME reiterates its 2020-21 pre-budget submission call for the development of a State Industrial Water Strategy to consolidate understanding and provide solutions to meet the water requirements of South Australian resources projects.

- SACOME calls for funding to DEM, DIS, the Department for Education, industry and other relevant entities for collaborative mapping of future skillsets required by the resources to better align education and training outcomes with future workforce requirements.