SUBMISSION BY THE SOUTH AUSTRALIA GOVERNMENT TO THE PRODUCTIVITY COMMISSION INQUIRY INTO SCIENCE AND INNOVATION

Introduction

The South Australia Government welcomes the opportunity to make a submission to the Productivity Commission Inquiry into Science and Innovation in Australia. This submission addresses some of the broad policy objectives of science and innovation in this country in relation to the national policy framework, science and mathematics education and the commercialisation of research. This submission also addresses specific needs of the smaller States, such as South Australia.

South Australia has adopted a whole-of-government approach to not only improving science and innovation but education, environmental sustainability and building better communities. South Australia's Strategic Plan (SASP) was launched by the South Australian Government in March 2004. The plan contains 84 targets, most of which have a 10 year timeframe (attachment 1) with the Government committed to reviewing the targets bi-annually. The first of these reviews has recently been completed by an independent advisory body, the SASP Audit Committee (attachment 2).

The areas of science and innovation fall within the 'fostering creativity' objective of the SASP, which emphasises creating a culture of creativity within the State. South Australian Government agencies have adopted implementation plans to meet the SASP targets.

During 2004 the Premier's Science and Research Council finalised the development of a 10 year Vision for Science, Technology and Innovation in South Australia (STI^{10}). Launched by the Premier in April 2004, this vision provides a strategic framework for building and marketing the State's capabilities in scientific endeavour, and technological development, and assists in the creation of new and innovative industries and businesses. STI^{10} contains 10 performance targets that are designed to monitor the success of this vision (attachment 3). The baselines for these targets are currently being compiled. These measurable targets will inform science and innovation policy as well as allowing the South Australian Government to monitor the effectiveness and success of these policies.

Constellation SA is the key implementation plan for STI^{10}. It describes a whole-of-government framework for focussing the Government's science and innovation activities. Constellation SA will provide a mechanism for strategically building research infrastructure and capability, increasing collaboration between research and industry as well as developing people and communities (see case study 1). It is based on the creation of five 'innovation alliances' of research, educational and industrial organisations, with each alliance having a specific theme of technology and/or industry activity (attachment 4). The agencies involved and some of their activities are described below.

CASE STUDY 1 - HEALTH & MEDICAL SCIENCE ALLIANCE

The total proportion of national funding grants to South Australia for health and medical research has been declining over the last six years. South Australia recognises the need to strategically co-ordinate health and medical research across the government health portfolio, universities and other research institutions with the aim of identifying and aligning strategic priority areas of excellence for research.

In order to achieve this aim, South Australia is developing a health and medical research framework to identify key strategic health and medical research priorities and initiatives ensuring that scarce resources are allocated and applied to research areas that have the potential to have the greatest impact on health and health care and/or is innovative in world terms.

Constellation SA is based on the creation of five 'innovation alliances' including a Health and Medical Science Alliance. The establishment of a Health and Medical Science Alliance will provide the forum to promote coordination and collaboration between alliance members, reduce fragmentation of research efforts, and provide the means to establish a critical mass for key research activities/clusters in South Australia that become nationally and internationally recognised.

http://www.constellationsa.sa.gov.au/

The Science and Innovation Environment in South Australia

Department of Further Education, Employment, Science and Technology

The Department of Further Education, Employment, Science and Technology (DFEEST) has within its structure four directorates; Information Economy, Science and Innovation, Higher Education and Quality which work closely with a wide variety of stakeholders including the skills and training functions of the department, other State, Commonwealth and local government agencies and organisations, Bio Innovation SA, Playford Capital, the State's three universities, Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Australian Government's Defence, Science and Technology Organisation (DSTO).

The four Directorates are focussed on specific areas

- Science and Innovation – focuses on maximising economic, environmental and social benefits from the State's scientific research and innovation. This directorate also provides executive support to the Premier's Science and Research Council.
- Information Economy – focuses on increasing industry and business use of ICT, specifically facilitating State-wide broadband infrastructure, e-business capability and ICT industry support and developing programs that address online literacy among target communities at risk of being marginalised by

advanced technologies. This directorate also provides executive support to the Information Economy Advisory Board, and the South Australian Consortium for Information Technology and Telecommunications.

- Higher Education – focuses on the coordination of State Government activities to support the development of the higher education sector in South Australia and provides executive support to the Higher Education Council.
- Quality – provides the regulatory framework for higher education in South Australia (attachment 5).

Department of Health

The Department of Health aims to improve the health and wellbeing of South Australians through the provision of high quality care. The department has a particular focus on health for all, through early intervention and illness prevention. Services are provided through the public hospital system, community centres and various outreach services. The department provides leadership in health reform, policy development and planning.

The department is committed to supporting and conducting high quality health and medical research, which is undertaken in South Australia through a cooperative enterprise involving universities, health units, independent research institutes, the private sector and the community. The major teaching hospital campuses (Royal Adelaide Hospital (RAH)/Institute of Medical and Veterinary Science (IMVS), Flinders Medical Centre, Women's and Children's Hospital, Queen Elizabeth Hospital) conduct the majority of South Australia's health and medical research. The largest research campus is the RAH/IMVS which includes the Hanson Centre. There are other research centres/institutes such as the Flinders Cancer Centre, the Basil Hetzel Research Institute, and the Child Health Research Institute. South Australia has built a strong national and international reputation in health and medical research, and is working to expand opportunities in this important area.

Department of Primary Industries and Resources

The South Australian Research and Development Institute (SARDI) is a world-class research and development institute delivering innovation to enhance the food, fibre and bioscience industries and living environmental systems in southern Australia. As the South Australian Government's principal research and development capability, its science programs embrace industry and community needs aligned to South Australia's Strategic Plan and 10-year vision for Science, Technology and Innovation.

SARDI pursues excellence through highly skilled scientists, post-graduates students and technicians supported by state-of-the-art research facilities at 14 locations throughout the State. Regional sites provide significant regional employment, community capacity, technology transfer and industry development. Programs focus on innovative, cost-effective technologies to meet emerging market needs that underpin internationally competitive and ecologically sustainable industries (SARDI Strategic Plan attachment 6).

Bio Innovation SA

Bio Innovation SA was established by the South Australian Government in June 2001 to accelerate the development of South Australia's bioscience sector. Its mission is to enable the creation of 50 new bioscience companies and 2,500 jobs by 2010.
The Bio Innovation SA team works with the bioscience community using a synergistic approach to industry development focusing on a range of commercial activities. Bio Innovation SA offers:

- high-level business development advice
- assistance with managing and leveraging government grants
- assistance with funding (from public and private sources)
- infrastructure development support
- marketing and communications services.

Terra Rossa Capital

In early 2006, Bio Innovation SA and the Motor Trades Association of Australia Superannuation Fund (MTAA Super) finalised the establishment of one of the largest venture capital funds in South Australia.

The 'South Australian Life Science Venture Capital Fund' is unique in that the entire investment capital will be provided by an interstate superannuation fund. It is built on the common goal of the South Australian Government and MTAA Super, to grow South Australia's bioscience industry. The fund is managed by independent fund management company, Terra Rossa Capital, with a respected team of industry professionals from across Australia and overseas. Although the fund has a 10 year investment horizon, Terra Rossa Capital is expected to make its first investment in 2006.

Terra Rossa Capital will work collaboratively with Bio Innovation SA to ensure steady deal flow of high quality emerging companies. MTAA Super is one of Australia's larger and best performing funds with more than 248,000 members, 18,400 employers and $3.2 billion in funds under management. MTAA Super was recently judged fund of the year for 2005/06 by leading independent industry analyst and research house, Super Ratings. Companies that will be eligible for funding through the South Australian Life Science Venture Capital Fund will be private early stage South Australian biotechnology companies or companies with a significant presence in South Australia. The amount of funding available to companies will be assessed on a case-by-case basis, though investments are likely to be in the range of $100,000 to $1 million.

Venture Capital Board

The Venture Capital Board's vision is to develop a strong private equity industry in South Australia that will positively influence innovation and development in local business sectors. The Venture Capital Board aims to:

- increase the supply of private equity in South Australia
- provide access to training and services to enable companies to become investor-ready and to access capital for growth and development
- influence a culture of innovation and business development.

In August 2005, the government announced an investment of up to $10 million in Paragon Advisory, a local private equity fund manager. This investment is part of the Venture Capital Board's South Australian Private Equity (SAPE) Program, which recommended allocating up to $10 million for the establishment of a South Australian based private equity fund. The ultimate aim of the SAPE Program is to increase the supply of private equity in South Australia.

Playford Capital

Playford Capital is a unique investor in the South Australian marketplace. It is the only local professional investor providing seed capital for start-up and early stage technology companies. Playford Capital's achievements include:

- investing $7.8 million in South Australian technology companies since 2001
- attracting more than $45 million in private co-investment
- assisting companies' sales growth by 22 per cent in 2004/05.

Playford seeks early stage investments from technology related areas, including software, hardware and electronics. Playford has invested in companies from a wide range of technology related areas. Playford Capital's team comprises of people with hands-on experience in growing technology businesses. These investment managers have had first hand experience in establishing and growing technology start-up companies as well as working in larger technology companies. They have managed product development projects, negotiated international distribution deals and raised capital for businesses in Australia and overseas. With qualifications in computer science, engineering, physics, electronics, accounting, finance, stockbroking, and business, the Playford team is well-equipped to assist companies to grow the value of their technology business. Playford offers access to this expertise on a no-fee basis from the starting point of technology business planning.

National Policy Framework

The South Australian Government is supportive of the *Backing Australia's Ability* packages that constitute a 10 year, $8.3 billion funding commitment to national science and innovation stretching from 2001/02 to 2010/11. The South Australian Government has also made science and innovation a priority area and is concentrating its efforts into key areas including defence, manufacturing and food and wine.

The general policy thrust of the *Backing Australia's Ability* packages has been to improve collaboration at all levels, set national priority areas, accelerate the commercialisation of ideas and invest in people and skills. These goals are commendable; however, the South Australian Government believes that there are continuing impediments and obstacles to these goals.

Over the life of *Backing Australia's Ability,* the size of grants made by the Commonwealth has increased. However, with the shift to larger grants, State matching funds required by the Commonwealth has also increased. This has been to the disadvantage of the smaller States such as South Australia and Tasmania.

The collaboration between research groups, universities and industry that this shift in Commonwealth policy has generated is a positive step, however, it has also decreased the number of smaller grants awarded. This reduction in small grants reduces the ability for researchers to test very early stage research ideas, or move into new or less established areas. Early career researchers may be disadvantaged by this shift to larger grants, as they are unlikely to be able to demonstrate previous research success to the level required to attract large grants.

The South Australian Government is also committed to the consolidation of research areas through the development of a critical mass of researchers in areas of high strategic importance to the nation.

Research providers are required by the Commonwealth to demonstrate increasing levels of collaboration. South Australia currently has three research universities, two of which were established in the last fifty years and therefore do not possess the large asset reserves of many of the eastern States universities. South Australia's industrial base, while significantly contributing to its economy, is much smaller than many of the other States. It is the view of the South Australian Government that these increasing collaborative requirements are contributing to the erosion of major projects coming to this State. An example is the National Collaborative Research Infrastructure Scheme (NCRIS).

The Commonwealth's NCRIS process has taken a much more collaborative and strategic national approach to infrastructure funding. However, some of the independent facilitators of the NCRIS process have provided inconsistent advice to State agencies and South Australian researchers on the levels of matching funds that are likely to be required. Provision of matching funds will be a challenge for the smaller States. It is important to ensure that existing excellence in small States is not duplicated or undermined due to the availability of larger pools of matching funds in the eastern States. It is therefore recommended that excellence be supported wherever it is located and that requirements for matching funds be tailored to the economic capacity of the host State.

The process for applying for and reporting on grants can be time consuming for organisations. The South Australian Government acknowledges that accountability and the reporting of the outcomes of grant money is important. The reporting requirements should be tailored to the size of the grant so as not to decrease productivity gained from the funding.

An issue for industry, when applying for Commonwealth assistance, is the high level of uncertainty associated with the often complex and time-consuming process of applying for Commonwealth grants. The South Australian Government suggests that a two-stage process, similar to the CRC application process may be of benefit (see case study 2).

CASE STUDY 2 - PROVISOR LTD

Provisor (http://www.provisor.com.au/) supports the Australian wine industry by helping to increase its global market share by producing quality wines at competitive prices. Grape and wine research into the factors that affect quality throughout the production chain and the commercialisation of research results will grow the competitiveness of Australian wine.

Provisor was established to secure the most progressive equipment, facilities and services for research. The company's objective is to ensure that the equipment is available to industry and research agencies and is highly utilised. Provisor aims to generate the funds required for equipment replacement and to establish a long-term self-sustaining research infrastructure for the wine industry.

Provisor applied for a wide range of Commonwealth funding to support the grape and wine industry. Grant applications are made through various bodies including the Grape and Wine Research and Development Corporation, AusIndustry (COMET) and the Department of Agriculture, Fisheries and Forestry (PCP grant).

From Provisor's perspective the main impediment to applying and receiving funds from these bodies is the time and resources invested in the grant applications. It is estimated that on average, between $10,000 and $15,000 is invested into applying for grants with no reward or reimbursement for unsuccessful applicants.

Although it is understood that this issue is difficult to resolve with competitive grants, it is suggested that a two stage screening process in the form of a one page initial application, be implemented so that applicants can 'test the water' before they invest heavily in grant applications. This would greatly reduce the risk of investing in grant applications that are unsuccessful. Another suggestion is to implement a reimbursement scheme of 50 per cent of resources invested into grant applications that are unsuccessful. This would encourage smaller industry

The Research Quality Framework

The South Australian Government has previously expressed its views on the Research Quality Framework (RQF) during the Commonwealth's consultative process in 2005 (attachment 7). The South Australian Government believes that if the RQF is introduced it needs to be carefully monitored to ensure that any changes in research activity have a positive impact on research quality. It is important that any framework including the RQF:

- encourages and allows new research activity to develop in different institutions or within faculties within institutions and does not merely reward excellence in current activity
- encourages and allows collaborative behaviour between universities and research institutions
- encourages and allows collaborative behaviour between research institutions and end users, including industry
- recognises differences between disciplines and types of research and reflects this diversity
- minimises costs and administrative burdens on universities and research institutions
- enables institutions to benchmark Australian research against world's best practice

- has credibility amongst researchers and institutions, as well as domestic and international stakeholders who may make judgements on the basis of its findings
- is transparent and simple to understand and its results and reasons for any funding decisions must also be made readily available.

Industry has a mutual role in research and the current emphasis on research quality rather than research impact of the proposed RQF may have a negative rather than positive impact on the collaboration between higher education institutions and industry. Examples of broader research outcomes that could be included in an RQF model to assess research impact could include 'commercialisation activities' in which research has directly led to the development and licensing of a patent, or other industry/business related activities. It is also important that any research framework recognises the development and diffusion of technology and knowledge into the community as elements of research impact. This can be measured using various metrics such as industry output data, academic publication activities, patenting and licensing activities, spin-off company formation with new jobs created, communication activities, income streams etc.

The South Australian Government suggests the RQF acknowledge and recognise that individual institutions specialise in different areas and have different missions – i.e. some universities are more academically (basic research) focused, whereas others are more industry focused, (applied research or experimental development) - both of which have merit. The parameters of any RQF should take these different approaches into account by measuring performance against the institution's missions. The RQF should recognise that all universities have a research function and any framework should be able to support growth in research activity even in institutions that currently conduct little research. The concern of the South Australian Government is that any framework developed to assess research quality will create an environment that will reward universities for existing research strength and stifle the ability to create innovation in new and emerging areas of research.

The South Australian Government is supportive of policies which are aimed at improving the efficiency and quality of research outputs from higher education institutions taking into account those considerations mentioned above.

Education

In recent years in South Australia there has been a significant decrease in the number of students studying science and mathematics-related subjects in secondary school and an associated decrease in applicants to these courses at universities. This situation has been exacerbated by a growing shortage of suitably trained science, mathematics and technology teachers. The South Australian Government is working towards a more coordinated approach to science, mathematics and technology education and is developing a whole-of-government strategy to address this issue. In addition, a more collaborative approach between the Commonwealth and State Governments could achieve even greater impact.

For example, the 'Growsmart' program, a collaboration between industry, the local community and the Commonwealth, addresses economic development in regional

areas, stimulates interest in science, while also tackling career development for local students (see case study 3). These are the types of programs which the South Australian Government would encourage the Commonwealth to pursue.

CASE STUDY 3 – 'GROWSMART'

'GrowSmart' Careers in Science is a partnership between the Riverland Horticulture Council, Riverland Secondary & Area Schools, University Science Faculties and the broader community. The 'GrowSmart' program is based on similar schemes running in both Tasmania and Western Australia which introduce students and teachers to careers in science and the horticulture industry.

The GrowSmart program has been applauded for seeking to encourage Riverland secondary students to study science and go on to higher education with the goal of graduating to become the next generation of highly skilled horticultural business managers, agronomists and technicians.

The 'GrowSmart' project is funded by Riverland Industry, and the

It is generally accepted that it is difficult for current teachers to keep abreast of rapid advances in science and technology. A practical solution could be for the Commonwealth to offer Higher Education Contribution Scheme (HECS) scholarships for currently employed teachers to improve or update their qualifications. The Commonwealth could also assist by identifying areas of specific skill shortages, for example mathematics and engineering, and provide targeted HECS scholarships to boost graduate numbers.

Nationally too many teachers are being trained in the primary areas while there is a shortage of secondary teachers, especially in maths and science. While Commonwealth support to increase the numbers of teachers is welcome and timely, simply capping HECS on teacher education courses is insufficient to encourage teaching students to undertake additional studies in areas of significant workforce shortage. Extending the HECS cap to courses that are integrated with teacher education, such as double degrees in education and maths and science, would encourage a greater number of students to enter the teaching profession with these much needed skills. This could be regulated by allowing capped HECS only to those students who opt to teach for a period after graduation. This needs a concerted national approach to guarantee the supply of quality maths and science teachers into the future.

At the tertiary level there are also issues with attracting school leavers into undertaking degrees in science, mathematics and technology areas with 2007 tertiary entrance rankings in South Australia indicating a decreasing demand (see box below). To encourage better uptake of degrees in specific areas of industry demand, the Commonwealth could introduce a range of incentive schemes including study scholarships co-funded with industry.

Commercialisation

There is a clear need for Australia to increase the level of private or business investment in research and development. Based on from the organisation for Economic Cooperation and Development's (OECD) 2003 report, the average investment levels of business in research and development is slightly over 2 per cent. Of the 30 OECD countries evaluated, Australia ranked 19th, lower than comparable countries such as Austria (2%), Belgium (2.5%), Finland (over 3 %), Sweden (over 4%) and the Netherlands (1.5%) (http://lysander.sourceoecd.org/vl=1659691/cl=12/nw=1/rpsv/scoreboard/a05.htm).

This does not mean that the level of public support for science and innovation should be reduced, in fact there have been calls to increase the Commonwealth's commitment. In July 2004, the Australian Vice-Chancellors committee called on the Commonwealth to increase research and innovation funding to equal 2 per cent of Australia's gross domestic product (GDP). This would bring Australia into line with other OECD countries. The South Australian Government advocates a balance of investment between public and private interests. Often private investment in this area is directed at solving particular industrial or business issues, whereas public funding can be directed at more 'blue-sky' research areas. The South Australian Government would support a Commonwealth policy mechanism to increase private investment in R&D, however this should not be at the expense of decreasing existing public investment.

Governments, by their very nature can tend to be risk averse and this tendency can be an impediment to fostering innovation. The South Australian Government encourages Commonwealth adoption of policies that build an improved operating environment for publicly funded research organisations to assist in the commercialisation of innovation and improve engagement with industry. It should also be acknowledged that the public-sector commercialisation model will need to be different from the private-sector model.

Funding for very early stage commercialisation or pre-seed funding is an area of great risk and presently there is a gap in funding availability. Through AusIndustry, the Commonwealth funds early stage commercialisation; however, matching funds from the private sector are required for both programs. This requirement for matching funding at the very early stage of the commercialisation process can be difficult to obtain as a commercial return can not be guaranteed. Therefore, these funds tend to be invested in later stage less risky projects (see case study 4) and the 'early stage gap' remains. A shift in policy by the Commonwealth to provide 100 per cent of the early investment capital for high quality proof-of-concept work for projects with commercial potential could greatly assist in the commercialisation of research generated by publicly funded research organisations.

CASE STUDY 4 - SUCCESS FOR AN SOUTH AUSTRALIAN BIOTECH

BresaGen announces Investment by Paragon Equity Ltd (16 August 2005)
Adelaide biotechnology company, BresaGen Ltd is pleased to announce, that Adelaide-based venture and development capital firm Paragon Equity Ltd, advised by Paragon Advisory Pty Ltd have invested $852,350 to acquire a 10% equity holding in the Company.

Paragon Advisory CEO, Geoff Thomas, said that he was delighted with the investment into BresaGen. "Paragon saw that there was substantial potential from the growth of BresaGen, both in performing contract Research and Development for companies around the globe, and the development and sale of biopharmaceuticals." Executive Chairman, Greg Boulton said "The investment into BresaGen is a long term investment for Paragon. We were impressed by the Management and Board of the Company, and its strategic direction."

"The investment from paragon is very welcome" said Dr Wolf Hanisch, BresaGen's Managing Director "... it strengthens our shareholder base and recognises BresaGen's emerging commercial value".

A recent report, complied by the Allen Consulting Group, assesses the economic benefit of the CRC program and indicates that there is an average lag time of nine years to achieve a quantifiable economic impact of research. This analysis indicates that the normal three to five years timeframe of the majority of Commonwealth grants could be a potential impediment to the achieving of economic benefits from research. This time lag, as pointed out by the report, is very dependent on the type of research which is being conducted and can be as short as four years or as long as twelve years. The South Australian Government would encourage the Commonwealth to consider the specific needs of each type of research as it develops future policies.

Summary of recommendations

- That, with particular reference to smaller grants, a modification to these grants occurs to simplify procedures and reduce the time commitment for both applications and reporting progress.
- The RQF should acknowledge the importance of the industry component of research impact as well as other issues raised by the South Australian Government's submission to the RQF.
- That the Commonwealth and States continue to work together on improving educational opportunities, at all levels, with an emphasis on science, mathematics and technology.
- That the Commonwealth consider incentives for current teachers to up-skill in the areas of science, mathematics and technology, for example by the introduction of HECS scholarships.
- That the Commonwealth endorses science, mathematics and technology as a national priority area, and extends the HECS cap to Bachelors degrees in targeted areas of skills shortage and by extending the HECS cap to teacher education students who undertake double degrees or graduate courses to develop their maths and science skills

- That the Commonwealth considers measures to increase private-sector investment in research and development in the areas of science and innovation.
- That the Commonwealth imbeds into future policies allowance for the different time lags for the commercial success of research in different fields.
- That the Commonwealth continues to work towards improving the operating environment for the commercialisation of research from public-sector research organisations.

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Table 1: increase in average total grant per centre and average amount awarded per year for round 6 – 8 of the Commonwealth's Cooperative Research Centre program.

Round	Total CRC program funds	Number of centres funded	Average total grant per centre	Average amount awarded per year (over 7years)
6	$421,572,000	26	$16,214,307	$2,316,329
7	$334,991,000	19	$17,634,105	$2,518,729
8	$449,880,000	21	$21,422,857	$3,060,408

Attachment 1: South Australia's State Strategic Plan.

Attachment 2: South Australia's State Strategic Plan 2006 Progress Report.

Attachment 3: STI10: A 10-year vision for Science, Technology and Innovation in South Australia.

Attachment 4: Constellation SA brochures.

Attachment 5: Department of Further Education, Employment, Science and Technology Annual Report 2006.

Attachment 6: South Australian Research & Development Institute Strategic Plan.

Attachment 7: South Australian Government submission to the Research Quality Framework.