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## Creative nation

The terms ‘creative industries’ or the more recent ‘creative economy’ are still evolving concepts, which despite their apparent economic impact in the era of digital technology are less recognised as part of the innovation system than science, research and technology. Yet, art and cultural activities have always been integral parts of innovation, including technological changes, and they are poised to become increasingly important drivers of economic activity.

Australia is blessed with natural assets – its vast mining resources, the extensive marine environment and the huge landmass sustain a range of established industries and provide opportunities for new ones, such as our emerging biofuels industry (see lead story, ARDR Jan-Mar 2012 edition). And the abundance of wave, wind and sun power is also likely to play a significant role in driving an emerging renewable energies industry, as well as securing the nation’s future energy supply.

Yet, the major contributor to Australia’s GDP and employment is the service sector, which in June 2011 accounted for around 70% of GDP (estimated based on data by the **Australian Bureau of Statistics**) and this is expected to grow even further in future. This is despite findings by a **House of Representatives Committee\*** in 2007 that many areas of services have limited scope for innovation.



There are notable exceptions, such as creative industries, which refers to a group of largely service-based industrial activities. The term evolved from the arts and cultural industries and conceptualises creativity as a key ingredient to commercial success. This potential was magnified with the innovation race throughout the 90s, which saw speculative equity in internet based intellectual property rapidly surpass industrial capacity. The dot-com bubble eventually burst, proving the ‘growth over profits’ strategy of the ‘new

economy’ to be unsustainable. But the creativity of the digital content sector continues to be a global driver of economic development.

The internet is only one, albeit very powerful platform for creative innovation. Companies like the US giant **Apple** and Sweden’s furniture firm **IKEA** sustain their businesses through

## All good, but...

In May, Australia's chief scientist **Professor Ian Chubb** released a report summarising the first phase of a project on the state and capabilities of the nation's science and research. The *Health of Australian Science* report focussed on the supply of skills through the education and training by schools and universities.

Overall, the report paints a positive picture of an internationally competitive sector, with more researchers per capita than most nations. Despite just 0.3% of the world's population, Australia produces 3% of world scientific publications, accounting for 4% of global citations between 2004 and 2008. The **2010 Excellence in Research for Australia** exercise revealed that Australia performed at or better than world standard in 10 out of 12 science-related fields of research between 2003 and 2008.

While the past decade has seen increasing funding for scientific research through the main funding bodies, the ARC and the NHMRC, the demand for grant support increased over the period, which led to an overall decline in the success rates of grant applications.

The report also notes a steady shift in R&D spending

*Gross expenditure on R&D (GERD) across the economy reached \$24.6 billion or 2.2% of GDP in 2008-09 - Australia ranks 14th in the OECD on this measure.*

*Of this spending, the Commonwealth (including through the Higher Education Sector) provided around 30%, and further contributed to business investment through various Commonwealth programs. In 2008-09, the Commonwealth and the Higher Education Sector contributed most of the \$3.67 billion received by Natural and Physical Sciences and the \$3.5 billion received by Health and Medical Sciences.*

*By contrast, most of the funding for Information Technology (\$5 billion) and Engineering (\$10 billion) was through the private sector.*

*In 2011-12, the Commonwealth allocated \$1.3 billion for research agencies, including AIMS, ANSTO, CSIRO, DSTO and Geoscience Australia.*

*Science professionals in the workforce (2006 Census data):*

- Health professionals: 338,000;
- ICT professionals: 144,000;
- Engineers: 79,000;
- Natural & Physical Sciences professionals: 66,500.

*Between 2006 and 2016, around 7000 Natural & Physical Science professionals will retire, while 120,000 respective graduates will enter the workforce, although many then working in other areas.*

since 2002, away from basic and strategic research and towards applied and experimental research, although there is no apparent rationale for this trend.

While the total number of students enrolments grew across all fields of education and all course levels between 2002 and 2010, the report shows that there are critical areas of vulnerabilities. Some areas of science have become less attractive choices for undergraduates, such as agriculture and the enabling sciences chemistry, mathematics and physics. The total number of Australian undergraduates enrolling in courses for commencing students grew by 23.6% over the period. However, enrolments in the field of health grew by 73%, while engineering enrolments increased by 21%, and the level of enrolments in the natural and physical sciences remained flat for the first five years of the period, and then grew again by 29% between 2008 and 2010. The number of students choosing agriculture and environment courses dropped by 4%, while enrolments in IT halved over the period.

Some areas of study are also subject to notable gender bias with only 14% of students in IT and Engineering being female.

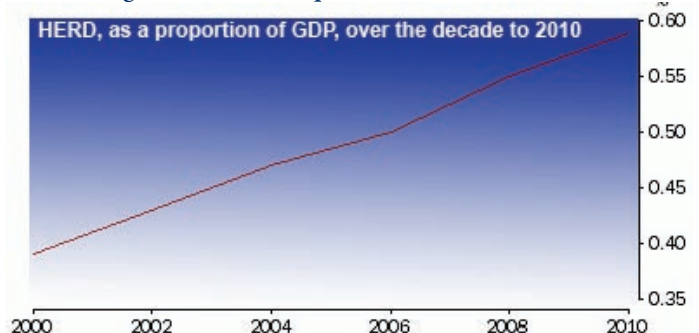
Despite the system of National Research Priorities, there is still a need for a clearer focus on such areas of education and research, and to fully develop potential in translational research and innovation.

At school level, the report concludes that despite students performing well on an international stage, neither the goal of lifting general science literacy in the community, nor preparing students for a study of science at university is achieved, with senior students in mathematics and science subjects in a steady decline.

► **More information:** [www.chiefscientist.gov.au/2011/10/health-of-australian-science-report/](http://www.chiefscientist.gov.au/2011/10/health-of-australian-science-report/)

## Up and up, but less of the basic

In 2010, higher education expenditure on R&D (HERD)



(a) See Explanatory Notes 14 to 16 for details.

was \$8.2 billion (current prices) in 2010, an increase of 20% over 2008, according to recent data by the **Australian Bureau of Statistic**. Almost three quarters of this growth was in Queensland, New South Wales, Victoria, with Queensland recording the largest increase in HERD in absolute terms. As a

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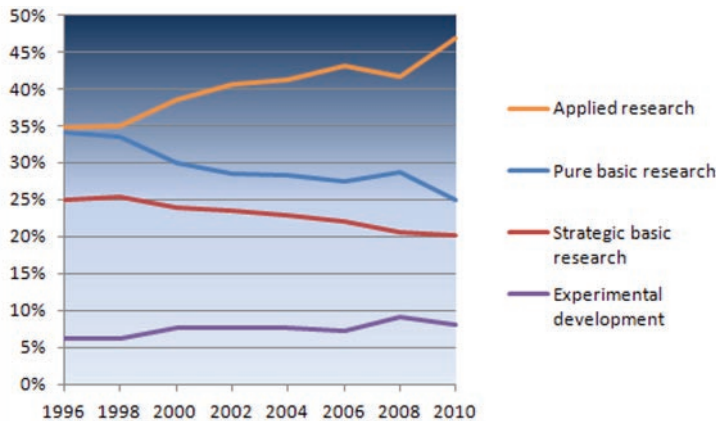
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Changes in the type of HERD funding over recent times  
graph: ARDR, created using data available from the Australian Bureau of Statistics



proportion of Gross State Product (GSP), the ACT had the largest increase, while SA, WA, Tas. and the NT did not record significant changes in HERD.

HERD as a proportion of GDP was 0.59% compared to 0.55% in 2008, and in line with a trend increase of the HERD/GDP ratio over more than a decade (in 2000, HERD was around 0.4% of GDP).

Looking at the types of research activity, the shift away from funding basic research towards applied research has continued. In 2010, applied research accounted for 47%, while 25% supported pure basic research and 20% strategic research. By contrast, in 1996 applied research accounted for only around 34% of HERD.

► [More information: www.abs.gov.au](http://www.abs.gov.au)

## Few make the monies

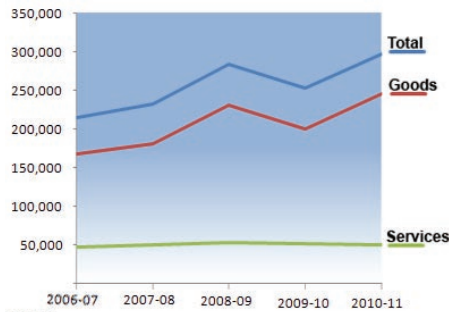
Domestically, Australia's economy may be dominated by its service industries, but as recent figures by the **Australian Bureau of Statistics** highlight, our trade is dominated by a relatively small number of firms exporting goods, with the mining industry by far the largest contributing sector.

In 2010-11, exported goods accounted for 82% of total Australian exports, after their value rose by 22.4% to around \$245 billion. By contrast, the value of service exports declined by 2.2% to around \$50 billion.

The bulk of exported goods came from the mining industry in WA (46%) and Queensland (20%), and further growth is likely on the back of record investments in mining and energy projects (see also '...as investments keep flowing' page 50).

Of the almost 43,000 exporters of merchandise, just 259, less than 1%, accounted for 85% of the total value of goods exported. The dominance of large firms is particularly pronounced in the Mining industry where just 573 exporters contributed \$134 billion or 54% to the total value of exported goods.

On the back of the strong Australian dollar, the Mining industry reversed a drop in exports value of around 10% in the previous year. By contrast, exports undertaken by the Manufacturing industry fell in value by around 16%, and the industry also contracted significantly in the number of exporting firms (186). Nationwide, the manufacturing industry now

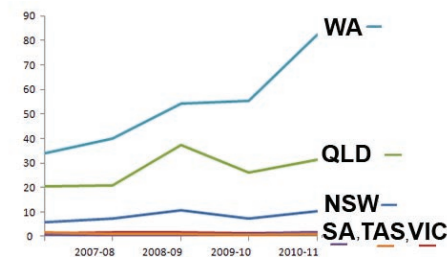
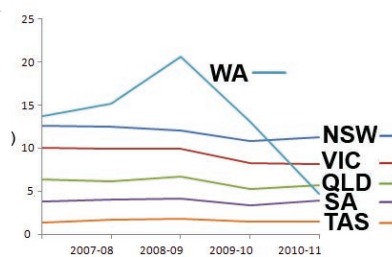


Exports of goods and services by Australian businesses between 2006-07 and 2010-11.

contributes 15% to the value of exported goods, followed by the wholesale trade industry with 11%.

However, the ABS data reveal that in most states and the NT the value of goods directly exported by the manufacturing industry either rose or remained stable, while they continued a sharp downwards trend in WA (see figure).

It is also important to note that a sizable portion of manufactured goods are exported through other industries,



Comparison of manufacturing and mining exports across states over time. Left graph: manufacturing; right graph: mining. (Note the drop in exports of manufactured goods from WA since 2008-09, while the State's exports in mining goods have steeply increased over the observed timeframe.)

Graphs: ARDR, using data provided by the Australian Bureau of Statistics

including Mining and Wholesale trade. Thus the value of exported goods that have their origin in manufacturing activities actually slightly increased from the previous year's \$87 billion to \$91 billion, and they have remained almost unchanged since 2006-07.

► [More information: www.abs.gov.au/ausstats/abs@.nsf/mf/5368.0.55.006?OpenDocument](http://www.abs.gov.au/ausstats/abs@.nsf/mf/5368.0.55.006?OpenDocument)

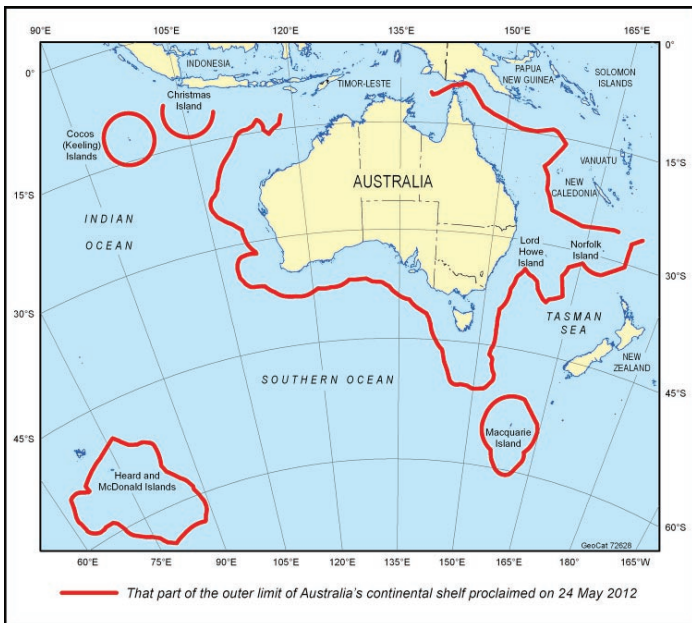
## Off the shelf

Australia has formally responded to recommendations by a **United Nations** commission to extend its marine jurisdiction by 2.5 million square kilometres: In May, the Government revoked the previous *Seas and Submerged Lands (Limits of Continental Shelf in the Tasman Sea and South Pacific Ocean) Proclamation 2005* with the *Seas and Submerged Lands (Limits of Continental Shelf) Proclamation 2012*.

With the proclamation, Australia has confirmed its exclusive right to explore and utilise the resources of the seabed within its continental shelf, an area larger than the Australian mainland.

In 2008, the United Nations Commission on the Limits of the Continental Shelf confirmed Australia's entitlements to its extended continental shelf, which stretches beyond 200 nautical miles from its territorial baseline. The ARDR covered this development, and the release of the 2009 *National Framework for Marine Science and Research* by the Government's **Oceans Policy Science Advisory Group** (OPSAG), in its April 2009 edition, including through a commentary by **Dr Robin Wagner** from the **University of Wollongong**.

The UN Commission's recommendations provided Australia the right to lay claim over an additional nine areas in



its extended Continental shelf. These include:

- Lord Howe Rise, east of Lord Howe Island and west of Norfolk Island;
- Three Kings Ridge, east of Norfolk Island;
- South Tasman Rise, south of Tasmania;
- Macquarie Ridge, south of Macquarie Island;
- Geat Australian Bight off South Australia;
- Kerguelen Plateau, south east of Heard Island and the McDonald Islands;
- Naturaliste Plateau, off the south west coast of Western Australia and west of Cape Leeuwin;
- Wallaby Exmouth Plateaus off the mid west coast of Western Australia; and
- the Argo area off the northwest coast of Western Australia.

The now enacted proclamation does not cover all areas of the continental shelf – for example it omits an area adjacent to the Australian Antarctic Territory (AAT) – and it does not represent new claims, rather it confirms where Australia has the exclusive right to explore and exploit marine resources (see also a piece by **Professor Tony Press** published by *The Conversation*).

► **More information:** [www.comlaw.gov.au](http://www.comlaw.gov.au)

## Challenged protection

The *ARDR* Sept-Dec 2011 edition dedicated the lead story to our marine resource, including the establishment of draft marine bioregional plans for Commonwealth waters, and a proposed network of marine reserves.

In June it all came to a head when the Government released its final network of marine reserves which, once proclaimed under national environmental law, will increase the number of marine reserves from 27 to 60, and cover more than a third of Commonwealth waters. With 3.1 million square kilometres it would be by far

the largest representative network of marine protected areas (MPAs) in the world.

While referring to our previous article for more detail, here is a brief update on the Government's policy.

Two major issues will weigh into the decision, the need for conserving our marine assets and its potential conflict with industry interests, such as commercial fishing. Compensation will play an important role, and together with its final proposal, the Government released an assistance package of close to \$100 million, which will flow to the fishing industry, assessed on a case-by-case basis, before marine reserves are activated.

The Government estimates that its planned reserves will displace approximately 1-2% of the annual value of wild catch fisheries production in Australia.

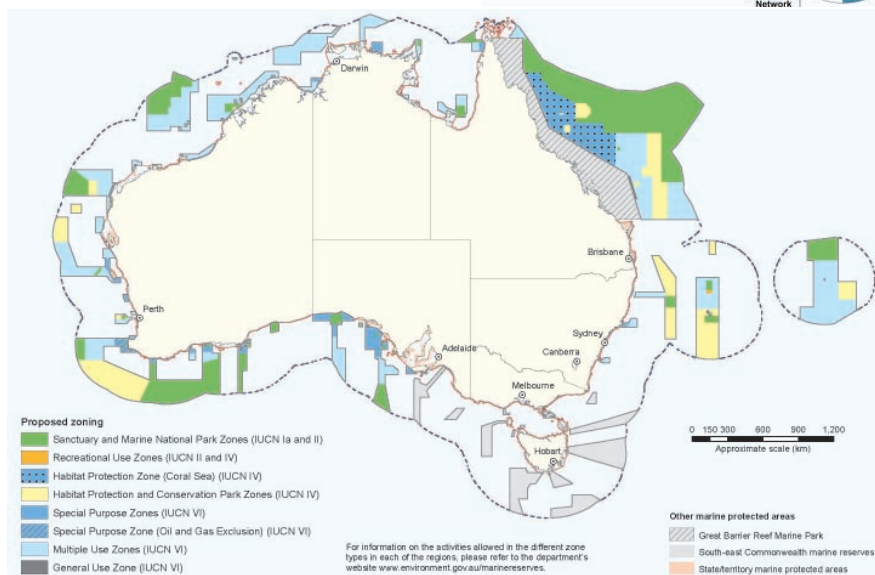
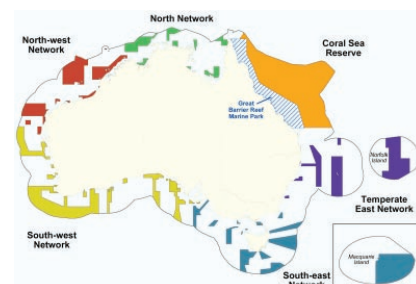
The new proposed marine reserves vary greatly in the degree of protection they deliver, guided by a classification by the **International Union for Conservation of Nature** (see figure).

For example, Marine National Park zones indicated as IUCN category Ia and II set highest levels of protection, including the establishment of a 'no-take' zone that excludes any form of extraction from the sea including recreational and commercial fishing. Multiple Use zones are less restrictive and provide for sustainable economic use and recreational fishing, while Special Purpose zones and General Use zones permit further activities.

In February, more than 300 scientists from 21 countries called on the government to extend the draft proposal for marine reserves, and declare the Coral Sea within Australia's exclusive economic zone as

*Network of marine reserves: indicated are the location of the marine bioregions (right) and the proposed marine reserve park zones (below)*

Image: provided by the Australian Government



*The marine reserves are part of the following marine regions:*

- *The Coral Sea Region includes protection for all reefs in the Coral Sea with the final proposal adding iconic reefs such as Osprey Reef, Marion Reef, Bougainville Reef, Vema Reef, and Shark Reef included as marine national parks.*
- *The South-West Marine Region extends from the eastern end of Kangaroo Island in South Australia to Shark Bay in Western Australia.*
- *The Temperate East Marine Region runs from the southern boundary of the Great Barrier Reef Marine Park to Bermagui in southern New South Wales, and includes the waters surrounding Lord Howe and Norfolk Islands.*
- *The North Marine Region includes only the Commonwealth waters of the Gulf of Carpentaria, Arafura Sea and the Timor Sea extending as far west as the Northern Territory-Western Australian border.*
- *The North-west Marine Region stretches from the Western Australian - Northern Territory border through to Kalbarri, south of Shark Bay in Western Australia.*

*A further network of marine reserves as part of a South-east Marine Region was already established in 2007, stretches from the far south coast of New South Wales, around Tasmania and Victoria and west to Kangaroo Island off South Australia*

the world's largest no-take zone. Under the now outlined network all reefs in the Coral Sea would be declared as Marine National Park zones, extending the cover proposed in its draft last year to reefs such as Osprey Reef, Marion Reef, Bougainville Reef, Vema Reef, and Shark Reef. Together with the adjacent Great

Barrier Reef Marine Park, it would establish the largest marine protected area world-wide.

The Government is expected to implement the marine reserves by the end of this year.

► **More information:** [www.environment.gov.au](http://www.environment.gov.au)

## Star wars final

At the end of May and after months of intense political negotiations, the **SKA Organisation**, a not-for-profit company established to lead the **Square Kilometre Array** project, announced everyone a winner with smiles all around.

Instead of deciding on one host, the organisation tasked both bidding contenders, the Australia-New Zealand partnership and South Africa, to share the hosting rights for the \$1.9 billion radio telescope. Many times more powerful than any radio telescope to date, the SKA will address fundamental questions about the evolution of the universe including the formation of black holes, the origins of the first stars and the generation of magnetic fields in space.

The project will scan the sky across a continuous frequency spectrum ranging from 70 Megahertz to 10 Gigahertz, for which it will employ different types of antennas – steerable dishes, and static mid and low frequency arrays, also called aperture arrays. Linked in a network, they will be equivalent to a dish with an area of about one square kilometre.

The decision to split the implementation followed an earlier scientific assessment of the two sites giving South Africa a narrow advantage. But a working group set up by the SKA organisation found that a dual-site implementation will benefit the first phase, both scientifically and financially, with the distinct advantage of making direct use of around 300 million euro already invested by integrating both the **Australian SKA Pathfinder** (ASKAP) and the **South African MeerKAT** telescopes.

However, while the decision for two sites hosting different technologies at different frequencies will also be capable of delivering the second phase of the project, the working group's report does anticipate significant additional costs. How much more money will be needed could not be assessed in detail as the second phase has not been fully designed yet.

The threat of a cost blow-out in the second phase is likely to remain a concern. Thus Nobel-prize winning **Professor Brian Schmidt** has been reported as saying that from the figures he has seen the cost increase from running the project at both sites "is likely to be 30%".

Still, the decision for a dual site implementation has received an overall positive response.

**Bryan Gaensler**, professor at the **University of Sydney** and a former international project scientist for SKA, said that establishing different technologies in different places will play to the strengths of each site. The Australia/New Zealand partnership will establish the lowest frequency component,

*The first phase of the project will establish around 10% of the array and will begin as early as 2016. South Africa will add 190 steerable high frequency dishes to its MeerKAT array, while Australia will add 60 mid frequency SKA dishes to its ASKAP facility and also build half a million low frequency dipole antennas.*

*The core of Australian SKA activity will be at the CSIRO operated Murchison Radio-astronomy Observatory (MRO), a radio quiet zone located 350 kilometres north-east of Geraldton in WA. The site already hosts the ASKAP radio telescope as well as other experiments such as the Murchison Widefield Array.*

*The SKA elements established on both continents will complement each other, with the Australian effort producing capability for a wide-angle view of the sky, while the African telescope will allow a narrower and more sensitive view of the universe.*



Top: An elevated view of CSIRO's new ASKAP antennas at the Murchison Radio-astronomy Observatory. Below: South Africa's Karoo Array Telescope (MeerKAT) will be a key instrument for the SKA.

Image: top Ant Schinckel, CSIRO; below, SKA Africa



which capitalises on the superb radio quietness of the SKA core planned for Murchison in outback Western Australia – "one of the few places on the planet that is not polluted by FM radio and other artificial signals in this low frequency band".

The higher frequency and more traditional steerable dishes will be built in Africa. Professor Gaensler said that this naturally extends on the MeerKAT array of dishes already under construction at the SKA core site in the Karoo desert region of South Africa.

"The remaining piece of the puzzle are phased array feeds, the fish-eye lens technology being developed by CSIRO for their ASKAP in Western Australia. These will be further developed and expanded in Australia and NZ, and then possibly later installed on dishes in Africa. Aus/NZ technology on an African telescope is truly a win-win scenario."

► **More information:** [www.skatelescope.org](http://www.skatelescope.org)

## Solar confusion

In June last year, the NSW **Moree Solar Farm** project was the photovoltaic project selected for funding in the first round of the **Australian Government's Solar Flagship Program**. A few months later it became clear that the project would not be able to meet all its funding commitments. As a result, the process of finding a worthy project for the mega funding was thrown up in the air again, with the Moree Solar Farm and projects from **AGL Energy, Infigen-Suntech** and **TRUenergy** asked to resubmit an updated application.

Now there is a new winner: the project by AGL and its partner **First Solar** (Australia) joins the winner of the Flagship's thermal solar category, Queensland's 250 MW **Solar Dawn** project, as Australia's stand out large scale solar projects with the potential to bring industrial scale solar power to the market. This all comes as the **Queensland Government** pulled the plug on funding Solar Dawn, putting this project now also in jeopardy (see below).

The AGL/First Solar project has been offered \$129.7 million to build its \$450 million advanced thin-film PV solar plant across two sites, a 106 Megawatt project in Broken Hill and a 53 MW project in Nyngan, which together will generate



million provided through the **Education Investment Fund** towards related research by the **Universities of Queensland** and **New South Wales**.

## Solar Dawn to Solar Dusk

The decision by the **Queensland Government** to terminate its \$75 million deed for the 250 megawatt **Solar Dawn** project at Chinchilla has been met with strong criticism by the **Australian Government**. It puts into doubt a funding commitment of \$464 million awarded through the Solar Flagship program to the \$1.5 billion project, which had also an additional \$68 million in solar research funding for the University of Queensland linked to it. In a statement released in early July, the Australian Government announced that the company had been given until 30 June 2012 to meet the financial conditions for the Flagship funding but was unable to do so. It will now be up to the new **Australian Renewable Energy Agency**, which launched 1 July 2012, to decide on the future of the project.

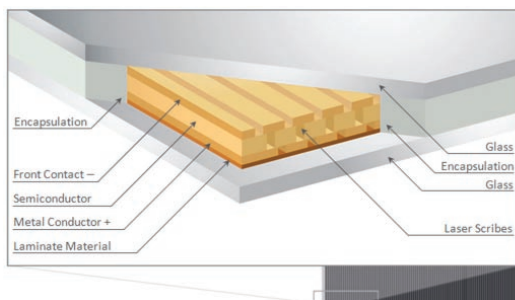
► **More information:** <http://minister.ret.gov.au>

## ...while the sun shines ever so cheaply

A new report by the **Bureau of Resources and Energy Economics** (BREE) titled *Australian Energy Technology Assessment (AETA) Report and Model* suggests that of 40 assessed technologies, including fossil fuels, renewables, biomass and nuclear power, some renewables such as solar photovoltaic and wind onshore could have the lowest 'levelised costs' for electricity generation. Levelised costs here refers to the price at which electricity must be generated from a specific plant to break even, taking into account the costs (including carbon price and CO<sub>2</sub> sequestration) incurred over the life of the plant.

While differences in the cost of generating electricity between the technologies will diminish, the levelist cost still vary substantially. Thus the report estimates that in 2012 the lowest cost is \$91/MWh for a landfill gas power plant, and the highest cost \$366/MWh for solar thermal. But in 2050, solar PV nontracking will be \$86/MWh (solar PV nontracking) compared to \$288/MWh for an IGCC brown coal plant.

The report concludes that the energy future of Australia is likely to dramatically change and this has also profound



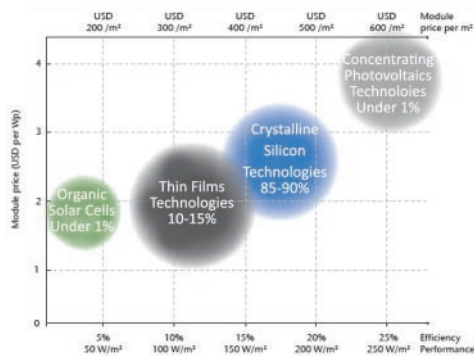
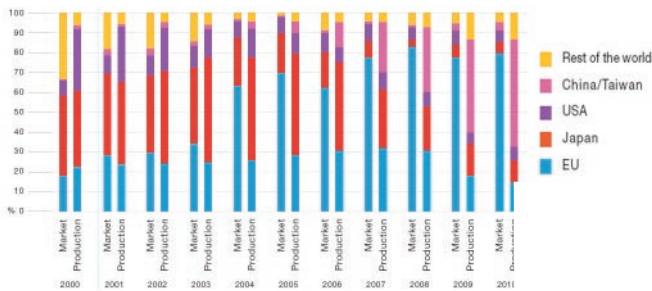
*The Nyngan project will utilise First Solar's advanced cadmium telluride (CdTe) thin film photovoltaic modules which, according to First Solar information, require only between 1-2% of the semiconductor material needed by traditional crystalline modules for comparable power generation. The modules generate electricity with no air emissions, no waste production and no water use, and have one of the smallest carbon footprints of any current PV technology.*

image: courtesy AGL

electricity powering approximately 30,000 homes. According to Energy and Resources Minister **Martin Ferguson**, the project offers the best value-for-money and the promise to be on track for completion in 2015.

The viability of the project is guaranteed by electricity and gas retailer AGL having signed a binding off take term sheet to acquire the electricity from the project. In addition, AGL announced in a company statement that First Solar will maintain the project for at least 5 years after commercial operation starts.

Further contributions to the project will flow from a \$64 million grant by the **NSW Government**, and a further \$40.7



*A few facts on solar photovoltaics. The top summarises the development of solar photovoltaic markets and production. Note that China has dramatically increased production over recent years, while its market is still relatively small. The bottom figure shows the price structure (2008) of different PV module technologies.*

Source: Top figure from the European Photovoltaic Industry Association report GLOBAL MARKET OUTLOOK FOR PHOTOVOLTAICS UNTIL 2015; Bottom figure: International Energy Agency Solar Photovoltaic Energy Roadmap

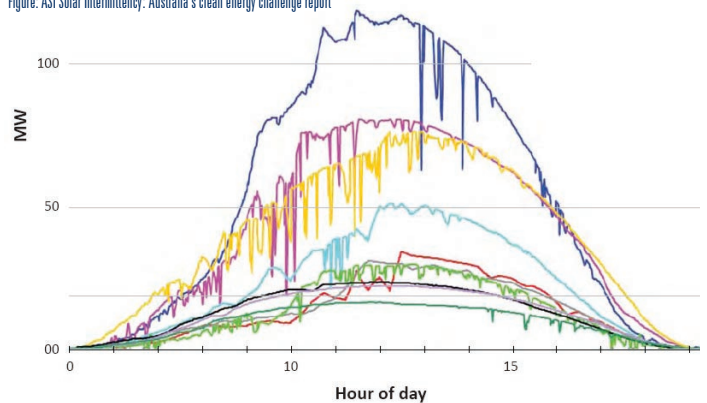
a 24-hour period, Germany's PV accounted for nearly a third of the nation's total electricity needs, and almost 50% at midday. While this is a remarkable record, it is many times over the average daily contribution of Germany's solar industry, which is currently around 3.5% of total electricity generation.

In addition to such extremes there are also more immediate fluctuations network operators are faced with, as clouds can cause a drop of photovoltaic power generation (PV) by 60% within seconds, which requires other generating sources to immediately respond to the net demand for electricity. Intermittency and grid integration are thus considered the two fundamental barriers for the uptake of large-scale solar power.

However, while concerns have led to a halt on renewable power generation in some network areas of Australia, the available information on the effects of intermittency on electricity networks is surprisingly scarce and largely anecdotal, according to a recent report by the **CSIRO's Energy Transformed Flagship**.

*Variability of photovoltaic output. The figure shows the PV output, including the sudden spikes and drops of power generation, at different zip codes in the western region of the US (coloured lines represent different zip codes).*

Figure: ASI Solar Intermittency: Australia's clean energy challenge report



Funded by the **Australian Solar Institute**, the report *Solar intermittency: Australia's clean energy challenge* is a review of world-wide research, consultations with power system operators collection and analysis of high-quality solar data. This includes ten months solar data from the **Desert Knowledge Australia Solar Centre (DKASC)** in Alice Springs, **CSIRO's Energy Centre** in Newcastle and Australia's largest flat panel PV system at the **University of Queensland**.

The report provides pathways to overcome the challenge of intermittency of large-scale generated solar power, including through a more flexible electricity grid. However, cheaper less flexible plants may need to be replaced with more flexible expensive plants to accommodate high penetrations of solar generation. Alternatively, ancillary services or additional generation could be used to manage PV power output fluctuations.

Intermittency is a general challenge posed by wind and solar power, but as the report details, the characteristics of the generated power vary greatly between the technologies employed. Importantly, the challenge for grid integration is also strongly influenced by the type of network, with Australia's

implications for electricity networks, energy distribution and the nation's projected greenhouse gas emissions.

Higher prices calculated for several fossil fuel-based electricity technologies differ from previous studies, and this is mainly a result of including a carbon price and higher projected market fuel prices. For the carbon price the report assumes an initial \$23/tonne CO<sub>2</sub> which it projects to rise to close to \$150/tonne CO<sub>2</sub> by 2050. The report also assumes that the large scale renewable energy target will remain in place to 2030.

Lower projected costs for solar energy take into account the recent dramatic drop in costs for solar photovoltaic technologies as a result of a rapid increase in global production of photovoltaic modules.

Nuclear and wind are already competitive today, which the report's authors based on the best available and most up-to-date cost estimates under Australian conditions.

Biogas and Biomass electricity generation technologies are also already among the most competitive technologies and will remain cost competitive out to 2050.

The data detailed in the report, which involved **WorleyParsons** and the **Australian Energy Market Operator**, will be updated every two years.

► **More information:** [www.bree.gov.au](http://www.bree.gov.au)

## Solar hiccups

The intermittent nature of power from wind and solar, and the challenges this poses for integration into existing electricity networks, has recently attracted attention when on a sunny day in May Germany's solar industry hit a new record of 22 gigawatt output, equivalent to 20 nuclear power stations. Over

unique situation requiring a customised set of solutions that adapt the nation's electricity network for renewable energy sources. Indeed, the report notes that the successful integration of high penetration solar power into the Australian electricity network is far from assured. "Although some initial investigations have been carried out in other countries, these have been of limited scope and are not necessarily applicable in the Australian context," the report states.

Each of the technologies have to be considered in context and on a case-by-case basis. Compared with wind, solar power is believed to be easier to integrate into the electricity system as its generation is more predictable and correlates more with demand for electricity. However, solar power is more instantaneously impacting on a network, and there are also differences between the two principle types of solar power technologies – the concentrating solar thermal (CST) and photovoltaic power generation (PV). While with both solar technology options clouds are the main cause of solar power intermittency, CST has the thermal mass of the working fluid providing some energy storage that smooth the transition. PV, by contrast, instantly responds to cloud disturbances. This plays out mainly on partly cloudy days, though, since on consistently cloudy or cloudless days there is little variability in PV generation.

Among the number of measures that can support large-scale solar power integration into electricity networks, the report lists accurate weather forecasting as vital.

Other measures include :

- using short-term energy storage systems;
- strengthening the electricity network so that intermittency effects are not as localised;
- controlling loads in response to network requirements;
- deploying additional ancillary services (using conventional generators);
- curtailing the output of renewable generators.

► **More information:** <http://csiro.au>

## Clean's the word

Early in July, the **Australian Government** launched its \$200 million **Clean Technology Innovation Program**, which is part of the **Clean Energy Future** initiative.

The program, which is administered by **AusIndustry**, will provide grants of between \$50,000 and \$5 million for projects that involve applied R&D, proof of concept or early stage commercialisation activities into new clean technologies and associated services. Supported areas include energy from wind, solar, wave, tidal, hydro or geothermal as well as biofuels and low emissions uses of coal.

The grant funding will be offered as a co-investment covering 50% of the project costs.

► **More information:** <http://minister.innovation.gov.au/gregcombet>



*... even when coal is on our mind*

The Government has also launched a \$70 million *Coal Mining Abatement Technology Support Package*, which aims to support the development of abatement technologies that reduce emissions from coal mining. The program supports three key areas including:

- Development and demonstration of abatement technologies and processes;
- Measures that address safety and regulatory issues associated with the development and deployment of these technologies; and
- Small and medium-sized mines to prepare carbon emissions abatement strategies.

► **More information:** <http://minister.ret.gov.au>

## Innovative stagnation

It was former Innovation Minister *Senator Kim Carr's* major mission to increase the number of innovative businesses in Australia. In the *Australian Innovation System Report 2011*, prepared by the former **Department of Innovation, Industry, Science and Research**, it states that innovative businesses are :

- twice as likely to report increased productivity;
- 41% more likely to report increased profitability;
- twice as likely to export; and
- up to four times more likely to increase employment and social contributions.

It further says that "the proportion of innovation-active business in Australia is the indicator used to measure and monitor the Government's target of a 25% increase in the proportion of businesses engaging in innovation over the next decade."

However, the **Australian Bureau of Statistics (ABS)** recently reported new data on innovation in Australian business, which suggest a decline in innovation activity across





Australian business. According to its survey, in 2010-11 there were 39.1% of businesses engaged in any kind of innovative activity, a decrease of 5 percentage points from the 43.8% in the previous year, whereby the figure includes 5.7% of businesses that abandoned their innovation during the period.

The percentage of businesses that did introduce a kind of innovation during the period, here referred to as innovating businesses, also declined, by 6 percentage points from 39% in 2009-10 to 33% in 2010-11.

The decline was seen across most types of innovation, which includes the introduction of new or improved goods and services, operational process, organisational or managerial processes, and marketing methods.

Innovation is highly dependent on business size and the sector of the business. While 65.9% of larger businesses (200 or more persons) were innovation-active, this was the case for only 30.5% of micro businesses (up to 4 persons). However, the decline in the number of innovation-active businesses was observed across smaller and larger businesses.

By industry, Wholesale trade recorded the highest proportion of innovating businesses (51%) followed by Retail trade (42%). The lowest proportion of introduced innovation was recorded by businesses in Transport, postal and warehousing (18%).

► **More information:** [www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/7C37F9185F692AFFCA257A2800145BB3?opendocument](http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/7C37F9185F692AFFCA257A2800145BB3?opendocument)

## All you need is ...R&D

Since 1 July 2012, eligible Australian businesses can register for the R&D Tax Incentive, a tax offset scheme for certain R&D related activities to support innovation particularly in smaller sized enterprises.

The scheme includes the following two components:

- a 45 per cent refundable tax offset (equivalent to a 150 per cent deduction) to eligible entities with an aggregated turnover of less than \$20 million per annum and an annual R&D expenditure of at least \$20,000.

- a non-refundable 40 per cent tax offset (equivalent to 133 per cent deduction) to all other eligible entities.

As Industry and Innovation Minister **Greg Combet** pointed out in a Government statement, for businesses with a turnover of less than \$20 million, the R&D Tax Incentive doubles the rate of support compared to the old R&D Tax Concession. For all other businesses the R&D Tax Incentive increases the support available by a third.

For companies to qualify for the Tax Incentive, which



is jointly administered by **AusIndustry** and the **Australian Taxation Office**, they must be either:

- incorporated in Australia;
- incorporated in another country but be an Australian resident for tax purposes; or
- incorporated in a country with which Australia has a double tax agreement, and undertake R&D activities through a permanent establishment in Australia.

There is no cap on the level of eligible R&D expenditure, which can include certain experimental activities defined as 'core' R&D activities, or 'supporting' activities that relate to core activities.

► **More information:** [www.ausindustry.gov.au](http://www.ausindustry.gov.au); information on the scheme can also be obtained through [Michael Johnson Associates](#)

## And all are beaming...

After the **Australian** and **Victorian Governments** finally agreed to invest \$100 million in the continued operation of the **Australian Synchrotron**, a new \$55 million program will support important research projects at the facility.

**Monash University** will manage the **Synchrotron Initiative**,

a peer-reviewed, merit-based program that will support research from biomedicine to art history over the next four years. It is supported through a \$30 million **Special Research Initiative in Synchrotron**



image: Monash University

**Science**, which will be jointly administered by the **ARC** and the **NHMRC**. In addition, more than 30 Australian universities have pledged to contribute a combined \$25 million in operational funding.

► **More information:** [www.monash.edu.au](http://www.monash.edu.au)

## Profitable sustainability

The **Australian Government** has become a founding partner of a new **Global Green Growth Institute** (GGGI), which will promote green growth partnerships between governments, business and NGOs. GGGI was first established in 2010 by the Republic of Korea as a non-profit institution to promote a paradigm shift in economic development that targets both economic performance and environmental sustainability. It has now transitioned into a fully-fledged international organisation, to which Australia, as a core partner, has committed \$10 million over 2 years. Australia is one of 16 nations that have signed the Establishment Agreement of the GGGI

► **More information:** [www.gggi.org](http://www.gggi.org)

## Linked up winners

For the second round of its 2012 investment in **Linkage Projects**, commencing in July 2012, the ARC has announced an investment of \$58.4 million in 185 new projects. They were selected from a total of 504 applications at an overall success

rate of 36.7%, which has significantly declined since 2009, as has the total amount of funding provided by the ARC (see figure).

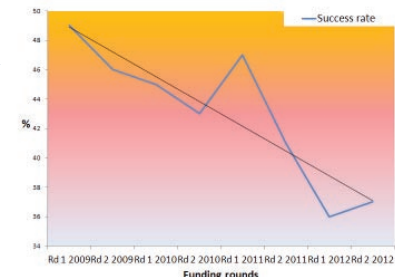
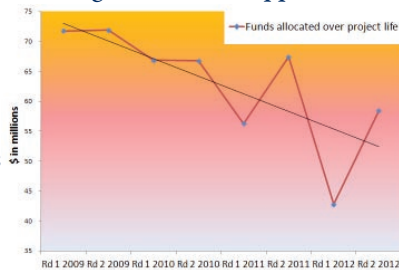
The 185 projects will leverage \$127 million in cash and in-kind contributions from partner organisations, of which around 50% are from the private sector.

The **Linkage Projects** grant scheme supports

collaborative research projects between higher education researchers and partner organisations in the public, private and not-for-profit sectors. To be eligible for funding, applicants must secure significant cash and/or in kind contributions to the projects.

Successful projects include:

- **University of Adelaide** partnership with **Gamma Vaccines** to develop a single vaccine that provides long-lasting protection against the flu and pneumonia;
  - **University of Wollongong** development of a high-energy, longer life lithium-ion batteries for cleaner energy;
  - **Deakin University** development to protect cyberspace that is essential to the daily work of Australian people, safeguarding Australia from cybercrime and terrorism;
  - A **University of Tasmania** project to safeguard the southern rock lobster fishery for the future;
  - A **Griffith University** project to identify the Queensland regions most at risk of flood; and
  - A **University of Western Australia** project to develop and install new sensors to monitor blockages in liquefied natural gas (LNG) production, which often cause expensive unplanned plant shutdowns.
- **More information:** [www.arc.gov.au](http://www.arc.gov.au)



Total funding and success rate of Linkage Project grants since 2009  
graph prepared from ARC data

## Born to be clean

In June, the **Senate** passed the *Clean Energy Finance Corporation Bill 2012*, after the **Australian Government** had accepted all recommendations detailed by an expert review of the proposed body. The passage has cleared the way for the establishment of a major component of the Government's **Clean Energy Future Package**.

The **Clean Energy Finance Corporation** (CEFC) will be set up as an independent body chaired by **Reserve Bank** board member **Jillian Broadbent**. It is expected to be operational from 1 July 2013 and will then have \$10 billion (\$2 billion per year over 5 years) at its disposal, which it will invest with the aim of breaking down the commercial barriers currently faced by renewable and cleaner technologies.

With a mandate similar to that of the **Future Fund**, the CEFC will leverage private sector financing for the commercialisation and deployment of renewable energy and enabling technologies, as well as energy efficiency and low emissions technologies. It will also drive the transformation of existing manufacturing businesses to re-focus on making the inputs for these sectors. In all investment assessments, the body will make its judgements on a case-by-case basis.

The *Clean Energy Finance Corporation (CEFC) Expert Review*, which included

Ms Broadbent, **Ian Moore** and **David Paradise**, writes in its assessment that CEFC investment is appropriate on the premise that policies such as the **Renewable Energy Target** and the carbon price continue to operate. The CEFC's task will be challenging having to juggle ambitions for a public policy outcome, while investing in projects that otherwise do not attract private funding, and without distorting those aspects of the market that work efficiently.

The ultimate goal, that net benefits of its activities outweigh the costs, can be achieved, the expert panel believes.

The review details a broader operating framework, which is based on three principles that should direct the CEFC investments:

- Principle 1 – the CEFC is to focus on the clean energy sector with 50% or more of funds allocated to a broadly defined renewable energies stream, and up to 50% used for a low-emissions and energy efficiency stream.
- Principle 2 – the CEFC will apply a commercial filter to investment decisions, focussing on later stage developments of projects; and
- Principle 3 – with its capacity of concessional funding the CEFC will address financial barriers but tailor concession to the least generous terms for a proposal to go ahead.

► **More information:** [www.cefcexpertreview.gov.au](http://www.cefcexpertreview.gov.au)



## Renewable optimism

A recent survey by KPMG suggests that the next new investments and acquisitions in renewable energy are most likely to come from China as the Asian region is finally making a move. This is against a backdrop of notable divestments of renewable energy by major European energy companies, although, as the report notes, this should not be confused with a lack of commitment to the sector. Many of the major European utilities are now shifting from merger and acquisition towards development and operation of their existing renewable asset portfolio.

In 2011, 42 gigawatt (GW) of onshore wind capacity and 25 GW of solar PV capacity was installed, more than in any other year, the report found. Still, 40% of survey respondents said they expect utilities to be very active in acquiring and investing in renewables over the next 18 months, and banks are getting more comfortable with financing major offshore wind projects – 45% of banks surveyed plan to finance offshore wind projects over the next 18 months.

But according to survey respondents, a recent trend of Asian investors towards acquiring renewable assets points to our region as being a centre of future activity. In 2011, Asian companies invested US\$2.1 billion in assets outside of Asia.

Renewable energy generation costs continued to fall significantly in 2011 to the extent that reaching grid parity is now seen as only a matter of time, and for the leading technologies it is expected to be achieved in the next few years.

The report concludes that despite a subsidy upheaval in key countries, the future of renewables looks bright.

► **More information:** [www.kpmg.com](http://www.kpmg.com)

## All stars outlook

The **Australian Astronomical Observatory** has released an outlook on the broad goals and strategies of the organisation for the period to 2015, and beyond to the end of the decade.

The *AAO Forward Look to 2015* also sets out a framework for implementing recommendations of the *Mid-Term Review of the Australian Astronomy Decadal Plan for 2006-2015*, which the Australian Academy of Science [released](#) in 2010.

The report addresses the AAO's ambitious task to be a world leader in astronomical R&D of innovative telescope instrumentation, as well as a leader in the formulation of long-term plans for astronomy in Australia. To this end the previously independent organisation is now better positioned as a well resourced and supported division within the **Department of Industry, Innovation, Science, Research and Tertiary Education**, the report states.

Australia can also build on considerable advantages, being well supported with a strong instrumentation program and access to a large telescope within the country, the AAO's flagship 4-metre **Anglo-Australian Telescope (AAT)** at **Siding Spring Observatory** in NSW. The nation's key capabilities

include both optical (AAO, ANU) and radio (CSIRO) wavelength, and there are strong synergies in the areas of wide-field astronomy, with ANU's SkyMapper and CSIRO's Australian SKA Pathfinder, and the AAO's complementary wide-field spectroscopy capabilities.

A top priority for Australian astronomers remains the radio telescope SKA, in which the AAO is only indirectly involved.

However, the near term future of Australia's astronomy is marked with some uncertainties in regard of access to the world's most powerful optical telescopes.

The AAO plans to operate the AAT for at least another decade, but while few organisations in the world have access

to their own large telescope, according to the AAO its 4-metre telescope also presents a major weakness. It operates at a moderate site (in the near future further challenged by mining projects in the area) in competition with 8-metre telescopes at superb sites in other parts of the world.

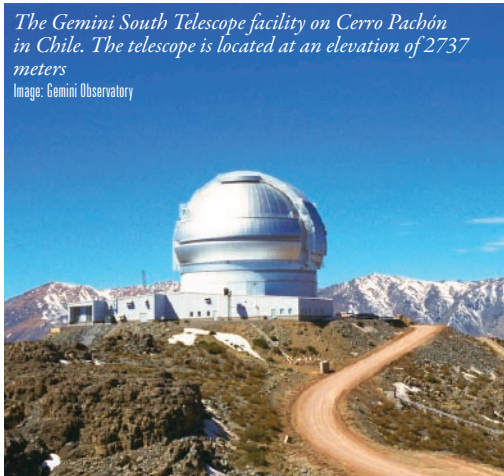
The **Gemini** partnership, in which Australia has a 6.2% stake and which runs 8-metre telescopes in Hawaii and Chile, is currently being re-negotiated. The AAO sees it as crucial that astronomers raise their access to the equivalent of at least a 20% share in an 8-metre telescope to remain globally competitive.

There is also a push to join the **European Southern Observatory (ESO)** with its 8-metre Very Large Telescopes in Chile and plans for a 39-metre European telescope, while Australia is a 10% partner in the **Giant Magellan Telescope (GMT)** consortium building a 25-metre telescope in Chile over the next decade.

One of AAO's key strength, though, is its instrumentation program with fibre feeds, robotic fibre positioners, optical and infrared spectrographs, and software. This includes the \$12 million **HERMES** to be launched in 2013, a unique new facility for multi-object astronomy, primarily used for the



*Dome of the Anglo-Australian Telescope.*  
Image: Stephen West, sourced from Wikipedia under Creative Commons license 3.0



*The Gemini South Telescope facility on Cerro Pachón in Chile. The telescope is located at an elevation of 2737 meters*  
Image: Gemini Observatory



*The GALAH survey will measure physical parameters and elemental abundances for 1 million stars in the Milky Way using the instrument HERMES, a new high-resolution multi-object spectrograph on the Anglo-Australian Telescope.*  
image: Australian National University

**Galactic Archaeology Survey.** The project aims to reconstruct the Galaxy's formation.

For the future, a major strategic direction will be photonics and astronomical applications, with major collaborations including the astrophotonic group at the **University of Sydney** and the photonics group at **Macquarie University**, as well as close international links with groups in Germany and the UK.

However, the report emphasises the broader role of the AAO, addressing a number of **National Innovation Priorities**, and providing potential commercial opportunities, for example through future astronomical photonic devices. The AAO will seek to facilitate the transfer of technology between university, research organisations and industry through programs such as the **ARC Linkage Projects**, the **Collaborative Research Centres Program**, **Commercialisation Australia**, the **Innovation Investment Fund** and the new **R&D Tax Incentive**.

► **More information:** [www.aao.gov.au/AAOForwardLook.html](http://www.aao.gov.au/AAOForwardLook.html) Budget scraps

## Budget scraps

The **Australian Government's** 2012-13 budget has one overriding theme – back to surplus, estimated by **Treasury** to reach \$1.5 billion in 2012-13, and growing for the three years after that. Net debt will peak at 9.6% of GDP, after the underlying cash deficit in 2011-12 was \$44.4 billion.

If they eventuate, the surpluses will be on the back of a mining boom. Businesses expect to invest a record \$120 billion in the resources sector in 2012-13, with a pipeline of investments currently at over \$450 billion. The Government expects to raise \$3.6 billion in 2012-13 (\$11 billion over 3 years) through the new **Mineral Resources Rent Tax**, and targeted savings totalling \$33.6 billion.

One of the services that will be hit is the **Australian Bureau**

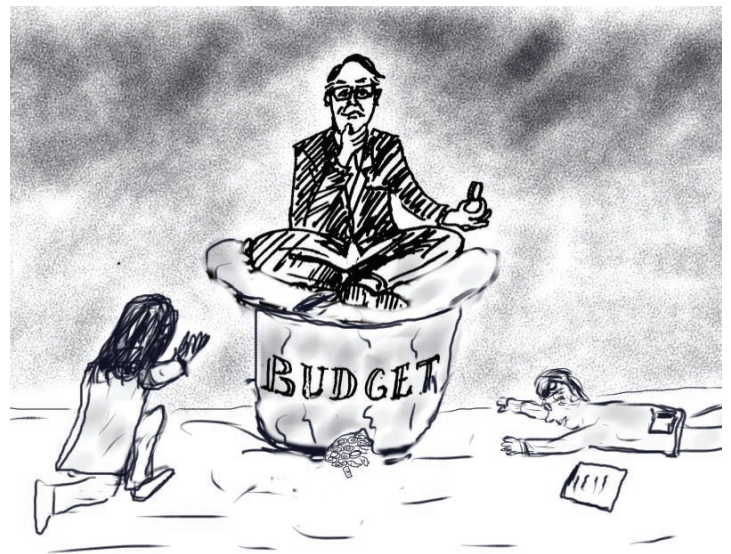
**of Statistics**, which will have to cope with a reduction in operating costs of \$255 million in 2012-13, down from a total budget of \$640 million.

The savings will outweigh a write-down in tax revenue of \$28 billion for the four years from 2011-12, a result of a number of factors including the current global uncertainty.

Growth in the economy is uneven and multifaceted. Beyond the booming resources sector, there are other parts of the economy doing well, including health care and social assistance and professional scientific and technical services.

The start of the carbon price on 1 July 2012 is expected to reduce real GDP growth by less than 0.25% in 2012-13.

Overall, science will be spared major saving measures, which was welcomed by the **Australian Academy of Science**, notably the extra \$54 million over 4 years to improve participation in the study of science and mathematics at school and university. However, the Academy's president **Professor Suzanne Cory** bemoaned the Government's failure to establish a strategic program for Australia's international scientific engagement following the winding up of the **International Science Linkages** program last year. There is also uncertainty over



continued funding of the National Collaborative Research Infrastructure Scheme (NCRIS). And while the CSIRO has its overall budget slightly increased, its operating expenses will be reduced (appropriated as an 'Efficiency Dividend') \$23 million over 4 years, with cuts in staff numbers expected.

In total, the Government has allocated around \$9 billion for science, research and innovation – an overall increase of 35% since 2007 it says.

A record \$1.72 billion is set aside for block grants supporting university research. They break down as follows:

- \$656 million for the **Research Training Scheme**;
- \$233 million for **Research Infrastructure Block Grants**;
- \$345 million for **Joint Research Engagement**;
- \$219 million for **Sustainable Research Excellence**;

- \$248 million for **Australian Postgraduate Awards**;
- \$22 million for **International Postgraduate Research Scholarships**.

The budget further provides:

- \$879 million to the **Australian Research Council** for competitive grant programs;
- \$736.77 million to **CSIRO**;
- \$31.56 million to the **Australian Institute of Marine Science**;
- \$162.72 million to the **Australian Nuclear Science and Technology Organisation**;
- \$12.89 million to the **Australian Institute of Aboriginal and Torres Strait Islander Studies**.

Indexed funding of \$4.4 million each year from 2012-13 will go towards Australia's learned academies – the **Academy of the Social Sciences of Australia**, the **Australian Academy of Science**, the **Australian Academy of Technological Sciences and Engineering** and the **Australian Academy of the Humanities**.

As previously announced, the **Australian Synchrotron** will receive \$69 million over four years, which complements a \$26 million contribution by the **Victorian Government**.

And the budget places, as could be expected, considerable weight on the Government's plan for a clean energy future, announced in the previous budget.

Following the legislation of the package a number of milestones have been achieved, notably the establishment of the Clean Energy Regulator, the body tasked with administering the Carbon Pricing Mechanism, the National Greenhouse and Energy Reporting, the Carbon Farming Initiative and the Renewable Energy Target.

Additional measures over the forward estimates include:

- \$37.1 million for a nationally-consistent legislative framework for Greenhouse and Energy Minimum Standards;
- \$2.8 million for a range of building energy efficiency activities; and
- \$3 million in 2012-13 to support the development of climate change adaptation policy and risk analysis.

► **More information:** [www.budget.gov.au](http://www.budget.gov.au)

## Food for all

The **Australian Government** has released a Green Paper of Australia's first **National Food Plan**, with which it aims to establish an overarching framework for its role in the national food system. The initiative is led by the **Department of Agriculture, Fisheries and Forestry**, but also engages other government sources at federal, state and territory levels, including a **Food Policy Working Group** and a **Food Processing Industry Strategy Group**. It builds on other Government reforms currently underway, including in the areas of nutrition, biosecurity, water, drought preparedness

and agricultural chemical use. Further related developments include a White Paper on Australia in the Asian Century, the Prime Minister's **Taskforce on Manufacturing**, the **Food Processing Industry Strategy Group** and the **Parliamentary Working Group on Water, Soil and Food**.

The establishment of an integrated approach that deals with the currently complex and



diverse national food system is less geared towards securing Australia's own food security – the nation produces far more than it consumes, at a value of \$27.1 billion in 2010-11. Rather, it is targeted towards potentially new opportunities arising in the Asian market, as world food demand is expected to rise by 77% by 2050 compared to 2007 levels, and most of this growth is to occur in Asia. The ramifications for the broader economy could be profound given that 15% of the Australian workforce is connected to the food industry, and it has particular importance for regional Australia.

The Green Paper focusses on seven major objectives designed

National Food Plan Green Paper objectives:

- Support the global competitiveness and productivity growth of the food supply chain, including through research, science and innovation;
- Reduce the barriers food businesses face in accessing international and domestic markets.
- Contribute to economic prosperity, employment and community wellbeing in regional Australia.
- Identify and mitigate potential risks to Australia's food security.
- Maintain and improve the natural resource base underpinning food production in Australia.
- Reduce barriers to a safe and nutritious food supply that responds to the evolving preferences and needs of all Australians and supports population health.
- Contribute to global food security.

Possible actions explored include:

- policy options to boost rural R&D through increased funding, and continued encouragement of innovation in the rural sector through rural R&D corporations, CSIRO, CRCs and others;
- building an evidence base for investments in infrastructure – already almost two-thirds of the Nation Building Program for transport infrastructure will support projects in rural and regional communities;
- potential mechanisms for greater access to Asian markets;
- regulatory reforms to strengthen the competitiveness and productivity of the sector; and
- potential cost reductions for businesses through changes to the regulatory environment – the Government intends to replace the *Quarantine Act 1908* with new biosecurity legislation acknowledging shared responsibility for quarantine between governments, industry and public, and to strengthen Australia's import/export systems, including a possible review of the *Imported Food Control Act 1992* and the *Export Control Act 1982*.

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innovative design as much as through technology development. In Australia, new brands such as fashion distributor Billabong and Mambo are examples of artistic input at the base of commercial success.

But, as **Helene George**, managing director of consulting firm **Creative Economy**, [pointed out](#) in a 2005 essay (*The Creative Economy and Why It's News*), despite its reputation for ingenuity and invention (for example, a recent *Global Creativity Index* by the Canadian think tank **Martin Prosperity Group** has Australia [ranked](#) 5th in the world), Australia has had difficulties to build on its lead and create brands with world recognition.

*Creativity links to commercial success: product branding*



Source: Cowboys branding a calf in a fenced area. South Dakota, 1888; image public domain

This may change as Australian policymakers are increasingly supporting creative industries, although much of the attention is centred on digital developments.

### *From the birth of a concept*

In 2005, an independent working group for the **Prime Minister's Science, Engineering and Innovation Council** [issued](#) a report *Imagine Australia* which outlined a new policy framework to support and harness creativity for better innovation outcomes. The proposed new policy settings recognise the potential of the economic paradigm 'creative industries', and promote broader cross-disciplinary and cross sectoral teaching and research.

While the report acknowledged that "globally, governments and thinkers are grappling with the economics of creativity and creative industries", it concluded that "there is a clear and pressing need to extend our existing whole-of-government approaches so as to incorporate creativity and culture into our future innovation policies."

In line with the 2005 PMSEIC report, a Government commissioned 2009 economic analysis of Australia's creative industries by the **Centre for International Economics (CIE)** [finds](#) that "creativity is closely linked to innovation" and that "... there is a symbiosis between innovation, technological change and the creative industries".

The *Creative Industries Economic Analysis* report draws a strong link between creativity and innovation and productivity growth. This growing importance of the creative industries for the economy is underscored in a recently emerged term, 'creative economy'.

The concept of creative industries is largely a political idea that evolved in the late 1990s with the realisation of the often unrecognised economic value of cultural industries, and more broadly the content production and copyright industries. A literature review on the topic by creative industries expert **Professor Justin O'Connor** from the **University of Leeds** [details](#) the significant impetus that resulted from the British **New Labour Government** after its election in 1997. It converted the **UK Department of Heritage** to the **Department of Culture, Media and Sport (DCMS)** and set up a 'creative industries task force', which led to a mapping of the creative industries. For the first time the cultural industries were established as an object of policy in the UK. According to Professor O'Connor, the shift of terminology from cultural industries to creative industries was not neutral, but "... it served to uncouple the 'creative industries' from 'arts and cultural' policy, yet hoping at the same time to recoup (some of) the benefits for those very arts and cultural policy agencies. Crucial to this political trick was the identification of the creative industries with a 'new economy' driven by 'digital' technologies and closely related to the 'information' or 'knowledge' economy."



According to Professor O'Connor, it was the exploitation of intellectual property rights (IPR) which was seen to provide the crucial link between these agendas – positioning the creative industries at the forefront of economic competitiveness.

### *...to creative policies*

Over the past decade, Australian governments at the federal and state levels have also developed policies that specifically target the creative economy. On a federal level, two institutions were established that are now central to research and support of creative industries in Australia.

The **ARC Centre of Excellence for Creative Industries**

**and Innovation** (CCI) was launched in 2005 as one of the first institutions of its kind in the world, and the first ARC Centre of Excellence targeting a sector outside the traditional areas of science, engineering and technology. It is funded until 2013, and currently in the second phase of its 8-year program.

More recently, in 2009, the Government established the Sydney-based **Creative Industries Innovation Centre**

(CIIC), which is part of the Enterprise Connect initiative that assists smaller sized businesses in their development. In the CCI annual report 2011, centre director **Professor Stuart Cunningham** describes the establishment of the CIIC as in itself a recognition that creative industries are an integral part of a knowledge-intensive small business sector.

This shift in national policy is also reflected in the 2008 *Review of the National Innovation system*, the ‘Cutler review’, which served as a template for the Government’s *Powering Ideas* innovation agenda.

Cunningham writes that by balancing the claims of breakthrough science with those of process innovation at the level of the firm, the Cutler review laid a necessary basis for attention to small business innovation “without prejudice as to its sectoral location”. He further notes that many Australian Government programs now explicitly encourage the humanities, arts and social sciences (HASS) sector rather than explicitly or implicitly excluding it.

However, the inclusion only goes so far. For example, criteria for the new **R&D Tax Incentive**, which commenced in July 2011, still specifically exclude HASS related activities from being eligible as ‘Core R&D activities’ supported under the scheme. This is despite the intense lobbying of representatives of the sector, including the **Australian Academy of the Humanities**, which had strongly urged the removal of this explicit exclusion, a legacy of the previous **R&D Tax Concession**.

Nevertheless, the new R&D support regime could be a significant boon to the industries in which small is the typical business size. The new Tax Incentive is generally more geared towards smaller and medium sized enterprises and companies with less than 20 million turnover can receive a 45% refundable tax offset (equivalent to a reduction of 150%), a far more generous support than was provided under the previous Tax Concession. Creative activities may also be eligible as



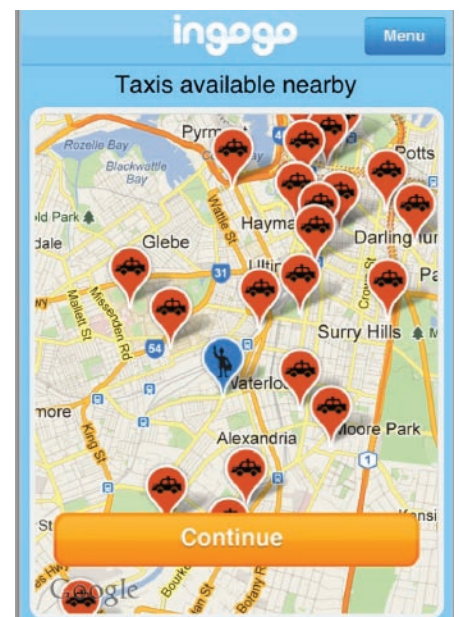
*Tax support for creative industries  
R&D: the new R&D Tax Incentive*

‘Supporting R&D activities’ that may directly relate to non-creative ‘Core R&D activities’.

Particularly digital developments could also significantly benefit from the Government’s **Commercialisation Australia** initiative, which is also geared towards smaller sized innovative firms. And while biotech and clean tech have been the winners under the scheme, creative innovations – to the vast majority software developments – have also been a major target.

According to the ARDR’s own analysis, around \$3.2 million of a total of \$37 million offered under the scheme since April were for creative industries innovations.

One example is a peer corporate taxi booking and payment system developed by **Ingogo Pty Ltd**. In April, it was offered \$250,000 to demonstrate Proof of Concept of its new technology. Through **Ingogo**, **mobi** passengers can directly communicate with taxis and book, hail and pay, bypassing the traditional dispatch model.



Another selected project, demonstrating the crossover of ICT technology development with classic art domains, is an online platform for crowd-sourcing music videos by **Genero Music Pty Ltd**. The company will use a \$230,000 grant to undertake Proof of Concept for an extended version of the technology.

And **PlayFi Pty Ltd** was granted \$120,000 for a Proof of Concept of its online music platform that allows any performer, concert venue or publisher to stream live performances using a broadband internet connection.

Already in 2005, the PMSEIC report recognised a shift in the understanding of how creative industries fit within the innovation system, and are supported as part of that system. It depicted a change from a society in which economic drivers were machines and natural resources, towards a knowledge-based society in which new technological developments extend and unleash the innate talents of people. However, the paper also pointed out that valuing creative assets may be more difficult as there may not be natural units or measures of production.

## Creative measures

The 3-year *Creative Industries National Mapping Project*, conducted by the CCI between 2004-07, began to establish a more robust evidence base for policy development and evaluation, including the development of better metrics to evaluate the impact of creative businesses and professionals. The program has continued as the CCI's **Creative Economy Mapping program**.

Data and methodology developed in the program were used in the 2009 CIE report, which then formed the basis of two more recent reports, the *Creative Economy Report Card 2011*

*Creative Industries, a Strategy for 21st Century Australia* contains three primary themes:

- Leveraging national foundations includes the objectives:
  - enabling innovation;
  - exploiting infrastructure;
  - investing in human capital;
  - harnessing research.
- Optimising commercial capacity
  - includes the objectives
  - improving business development;
  - pursuing trade & investment;
  - identifying markets & meeting consumer demand.
- Growing creative content and services
  - includes the objectives:
  - driving creative innovation;
  - powering IP & copyright;
  - exploring flexible business models;
  - promoting collaborative networks & spaces.

inclusion of culture and the arts, it could include a composite of activities that produce creative content, including general scientific R&D. But this still leaves the question of how much of the value chain is creative process and thus part of it.

For example, a widely cited definition by **John Howkins** includes creative goods or services as well as the value that is added downstream in the product development by carriers of such goods and services. These are excluded in the CIE's approach to creative industries, which is in accordance with a definition by the UK DCMS from 1998. The report included the following industry segments:

- music and performing arts;
- film, television and radio;

by the CCI and the Government's 2011 [document](#) *Creative Industries, a strategy for 21st Century Australia* (see box).

However, even the most recent figures used in these reports are by and large half a decade old, drawn from 2006 Census data.

A persistent difficulty is in defining what creative industries actually are (see also box). In broad terms it describes the generation of creative intellectual property that could potentially be commercialised. However, there is no standard approach—beyond the general

- advertising and marketing;
- software development and interactive content;
- writing, publishing and print media; and
- architecture, design and visual arts.

In addition, the CIE report, which details a framework for defining and measuring the sector and provides a statistical summary of its economic dimensions, constrained its focus on the processes at the stage of pre-creation and creation of products.

Using data by the Australian market research organisation **IBISWorld**, the CIE estimated that in 2007-08 around 107,000 businesses operated in the creative industries and generated an industry gross product of \$31.1 billion. This equals around 2.8% of Australia's total gross domestic product in that year.

The report further revealed that in the 11 years to 2007-08, growth of creative industries averaged 5.8% per year. This was considerably more than the growth of GDP, which averaged 3.6% per year over the period. However, the individual industry segments differ considerably. Thus music and performing arts industries contracted at an average rate of 1.7%, while the software & interactive media industry segments grew by around 9% over the period.

*The struggle of defining Creative industries*

*A paper published in 2008 in the Journal of Cultural Economics, authored by researchers from the Queensland University of Technology and the CCI, highlights how uncomfortable the creative industries sit with the standard industrial view of classification, "first, because they share many generic characteristics of the service economy; and second, because they are to a large extent an outgrowth of the previously non-market economy of cultural public goods and private imagination that seeks new ways of seeing and representing the world."*

*The papers' premise is that creative arts, broadly conceived, creates knowledge and, according to evolutionary economists, economic growth is linked to growth in knowledge, but that this takes predominantly place in what the authors describe as social network markets.*

*Implicitly, CIs can thus be defined as a set of economic activities in which production and consumption outcomes are predominantly determined by market-like processes on social networks.*

*One of the important implications of the proposal for policy is that it moves away from regarding CIs as part of the social welfare to one that is part of the innovation system of an economy. Instead of a lagging sector it becomes a leading sector.*

*The authors note that "CI policy is only as good as the analysis it is based on, and with the theoretical advance of network analysis, coupled with better micro data about these social networks, a new space for CI policy may open up along similar lines to science, technology and innovation policy.*

► **More information:** Potts et al (2008) *Journal of Cultural Economics* 32, 167-



Software development & interactive media accounted for the largest share of around 44% of the creative industries gross product in 2007-08. Businesses in the writing, publishing & print media segment contributed another 22%, followed by film, television & radio (~15%), architecture, design & visual arts (~12%) and music & performing arts (~3.5%) and advertising & marketing (~3.5%).

The CIE report estimates that in 2006 around 278,000 people were directly employed in the creative industries, more

than in Agriculture, forestry and fishing or Mining. And this still underestimates the amount of people employed to perform creative tasks

or in support of those, as it includes only 'specialist creatives' employed to perform a creative task in a dedicated creative industry segment. However, these form only a portion of people employed in creative occupations. The CCI improved on this assessment through the development of a so called Creative Trident methodology, which also recognises creative employees that work in non-creative industries (embedded creatives). These were found to account for more than half of all people employed in creative occupations. The method also captures support staff in the creative industries. Using this approach, the CIE estimated in its report that the creative workforce totalled around 438,000 people in 2006, almost 5% of the total workforce.

While other key indicators, such as productivity and international trade, are even more difficult to assess because of the nature of the creative process that leads to a product, the CIE calculated that Australia is in most years a net importer of creative content, with a net export deficit of around \$2 billion in 2007-8.

## Strategic ambitions

In August last year, the Government took the step of recognising the emerging importance of creative industries at a national level with the release of a **Strategic Digital Industry Plan (SDIP)**.

*Creative Industries, a Strategy for 21st Century Australia* also provided an opportunity to promote the Government's core infrastructure project, the **National Broadband Network (NBN)**, which it sees as a key enabler for the growth of creative industries. By the same token, it also highlights the importance the Government places on digital content using the Internet as a platform of use and distribution. In line with this, the Government established an **Information Technology Industry**

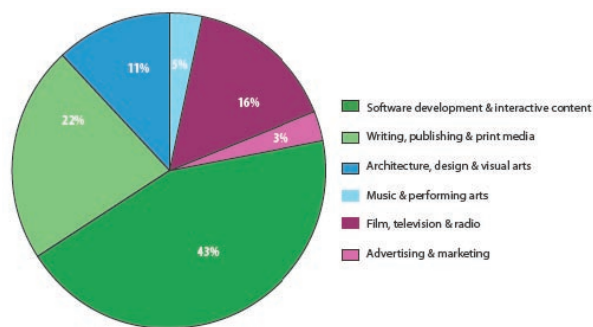
*Creative Industries Strategy Paper*: Programs and initiatives supporting the creative industries:

- The **Australia Council** – the Government's principle arts funding body spent \$164 million for 1800 projects in 2009-10;
- the **Digital Education Revolution** initiative in schools, as well as the plan to include the Arts in the second phase of the national curriculum;
- Eight national arts training facilities – the **Australian Ballet School**, **Australian Film Television and Radio School**, **Australian National Academy of Music**, **Australian Youth Orchestra**, **Flying Fruit Fly Circus**, **National Aboriginal and Islander Skills Development Association**, **Dance College**, **National Institute of Circus Arts**, and **National Institute of Dramatic Art**;
- the **Creative Industries Innovation Centre** and **Centre of Excellence for Creative Industries and Innovation**;
- the \$17 million **Enterprise Connect Creative Industries Innovation Centre (CIIC)** targeting small-to-medium size businesses (SMEs);
- Initiatives targeting industry skills such as:
  - the South Australian **Mobile Entertainment Growth Alliance (MEGA)** an industry-led entrepreneurship masterclass series designed to boost creative, technical and business skills in the mobile, digital content and ICT industries; and
  - the **Interactive Skills Integration Scheme**, a 2-year project collaboration between the CIIC, the CCI and the **Queensland University of Technology Creative Enterprise Australia**. The initiative is to support Australia's struggling games industry, by exploring the commercial application of interactive media in non-games industries.
  - The **ArtStart** program implemented by the Australia Council, providing grants worth \$10,000 for artists establishing a professional practice.

► **More information: Creative Industries Strategy paper**

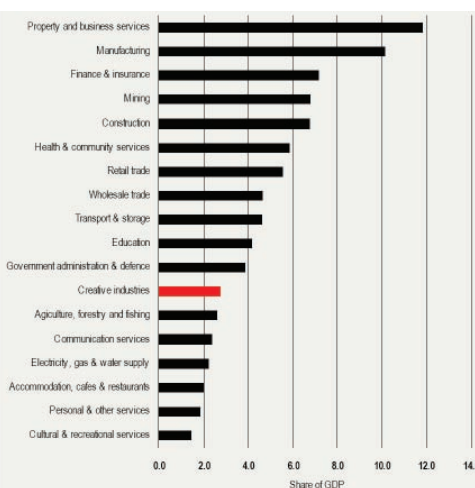
**Innovation Council** that promotes the IT sector in its own right.

The strategy paper lists a number of specific Government commitments designed to boost creative skills through education and training and harness research (see box for more information). However, it is complementary to the development of a more comprehensive **National Cultural Policy**, a 2007 election commitment by the former Rudd Government. So far



*Creative industries: share of industry segments.*

image: sourced from the Australian Government's *Creative Industries, a strategy for 21st Century Australia* document, with data based on the *Creative Industries Economic Analysis 2009* report by the Centre for International Economics



*Industry share of GDP (average 2004-05 to 2007-08)*  
figure sourced from *Creative Industries Economic Analysis 2009* report by the Centre for International Economics

there have been two major reports together with a green paper setting out a 10-year strategic vision for Australia's arts sector ([released](#) for discussion mid last year). While the policy was due in early 2012, it has been delayed in order to incorporate a number of recent reviews: These include:

- a review by the **Australia Council**;
- a *Review of Private Sector Support for the Arts* (Mitchell review) [released](#) in March 2012;
- a review by the **Book Industry Strategy Group** to support the book industry in adjusting to the digital environment – a Government response was [released](#) in June;
- the **Convergence Review** (see below) and
- the **Australia in the Asian Century White Paper Task Force** headed by *Dr Ken Henry* (submissions to the paper closed in April).

### Protected creation

Creative industries typically provide services and their income is often based on royalties. Copyright issues are thus of central importance for the industries, and this business concept is challenged by the emergence of digital media, confronting law makers with a difficult task of balancing open exchange of information through the Internet against copyright protection.

In the US, the proposed and highly controversial **Stop Online Piracy** and **Protect IP** acts are designed to curb



*While the proposed legislation would be confined to the US, the Stop Online Piracy Act (SOPA) and the Protect IP Act (PIPA) sparked debate about Internet regulation worldwide. On 18 January Wikipedia and Reddit websites blacked out for 24 h in protest against the proposed legislation.*

public access to websites that have 'no significant use' other than infringing copyright, enabling or facilitating copyright infringement.

Separate to this, the **Anti-Counterfeiting Trade Agreement** (ACTA) is a proposal for an international trade agreement to establish global standards for intellectual property rights enforcement. The initiative, to which Australia has also signed up, may be dead in the water, though, after it was rejected

*The World Intellectual Property Organisation defines four classes of copyright industries:*

1. Core industries exist only because of copyright and are primarily involved in the creation, manufacture, production, broadcast and distribution of copyrighted works.
2. Partial industries have a portion of the industries' activities related to copyright through manufacture, performance, exhibition, broadcast, communication or distribution and sales.
3. Interdependent industries are involved in the manufacture, performance, broadcast and communication in order to support and facilitate the creation of copyrighted works and other protected subject matter.
4. Non-dedicated support industries include duties where part of the activities are related to broadcast, communication, distribution and sales in protected subject matter and they are not included in the core copyright industries.

*The PCW Copyrights industries report's main findings include that in 2011 copyright industries:*

- generated \$93.2 billion in economic activity (6.6% of GDP);
- accounted for just over \$7 billion in exports (2.9% of all exports); and
- employed more than 906,000 people (8% of the nations workforce).

by the [European Parliament](#) in July because of concerns that it would limit Internet freedom.

In Australia, the Government recently released the final [Terms of Reference](#) for the **Australian Law Reform Commission**, which will determine whether exceptions and statutory licences in the *Copyright Act 1968* are still adequate in the new environment.

The importance of IP rights to the creative industries and the

challenges posed by the mainstream adoption of Internet, digital production and distribution are also discussed in the latest report of Australia's copyright industries which, as defined by the **World Intellectual Property Organisation** (WIPO, see box), are centred on creative industries, but also include manufacturing and distribution-based industries.

*Economic Contribution of Australia's Copyright Industries* was prepared by **Price Waterhouse Coopers** (PWC) for the **Australian Copyright Council** and [released](#) in July. It reveals that the industries economic contribution measured as 'value add' is in decline since the Global Financial Crisis, from a peak of \$100.2 billion in 2007 to \$93.2 billion in 2012. While its scope is beyond this article, the report depicts a 'perfect storm' rattling the industries, which is generated by rapid content digitisation, more consumers comparing prices online, increasing copyright infringement, and the high Australian Dollar. In this environment, there is a need for an appropriate regulatory model to support copyright businesses' innovation and sustainable growth, PCW concludes.

*Convergence Review:*

In April, the **Australian Government** released the final report of the **Convergence Review Committee**, which was led by **Glen Boreham**.

The review provides an analysis of the media and communications regulatory framework and its future direction in a rapidly changing media landscape. Its overarching conclusion is that parts of the current communications environment are overregulated. Thus it recommends that the current requirements of broadcasting services should cease.

However, against the backdrop of media convergence, and its overall positive effect, the review finds that continued regulation is justified in the three areas of 1) media ownership, (2) media content standards across all platforms and (3) the production and distribution of Australian and local content.

While convergence has increased the range of information available to Australians, who access their news now in different ways, the source of content largely remains the same. The report details 31 recommendations aimed at maintaining diversity of ownership of news and commentary providers at the local and national level, the standard of content, and the significant challenge of ensuring that Australian content continues to be represented in our media. Thus the review proposes a 'uniform content scheme' under which certain service providers will have to invest a percentage of their revenue for Australian drama, documentary and children's programs.

According to the review, adoption of the scheme would be a significant departure from current obligations.

The review proposes a shift away from the current 'black-letter law' regulation towards a principles-based legislation that provides more flexibility in responding to future challenges of convergence.

Regulation should be at arm's length from Government, and the review proposes replacing the existing **Australian Communications and Media Authority** with a statutory regulator with powers that complement the **Australian Competition and Consumer Commission**. It further recommends the establishment of a new industry-led body to oversee journalistic standards.

► **More information:** [www.dbcde.gov.au/digital\\_economy/convergence\\_review#report](http://www.dbcde.gov.au/digital_economy/convergence_review#report)

*Converging problems*

The Internet and emerging social media have also dramatically impacted on the distribution of media content, with a convergence of the major communication platforms, which are broadcasting, telecommunications and online. Thus video content previously distributed through television is now also accessed through the Internet. However, the



current regulatory frameworks were designed prior to these developments and need to be adapted to the new circumstances. At the end of April, the Government released the final report of the **Convergence Review**, which in broad terms recommends a major overhaul of the current regulatory system (see box for more details).

*Creative states*

State Governments are also reacting to the economic potential of creative industries. Several states have mapped their creative capacity and some have heavily invested in identified growth areas such as the video games industry, a major prong of the digital entertainment sector. According to data provided on an Australian Government [website](#), around half of the nation's over 40 companies developing video games are now centred in Melbourne, with another major centre of activity in Queensland.

Queensland has been early in developing a more comprehensive strategy, *Creativity is Big Business: A Framework for the Future*, which was released in 2005. The state is also home to Australia's first incubator for experimentation and commercial development in the creative industries. The Creative Industries Precinct at the **Queensland University of Technology**, a \$65 million investment, was launched in 2004 to

stimulate new research, products and businesses in the creative industries such as games development, web broadcasting, design, fashion, and publishing. It is associated with the **Institute for Creative Industries and Innovation**, which houses the ARC Centre of Excellence for Creative Industries and Innovation.

South Australia released a report into its creative industries in 2005. It identified sectors with the greatest growth potential and detailed strategies to develop the industries. The **SA Government's 2007 Strategic Plan** included a target to increase the number of South Australians working in creative industries by 20% by 2014. However, the Government removed the target in its **2011 Strategic Plan** citing difficulties collecting relevant data.

The **Western Australian Government** released a comprehensive analysis of Perth's Creative Industries in 2008. The report found that Western Australian industries especially suffer from the city's isolation from industry decision-makers and investors. "The fact that the vast majority of CI organisations are very small and so suffer a lack of scale, leads to significant shortcomings in business capability, financial capacity and a capacity to generate intellectual property (IP)".

Nevertheless, the report highlighted the key role creative industries play in the state's economy, also as a major employer. Between 1996 and 2001 employment in metropolitan Perth's creative industries grew by 7.3% each year, while employment of Western Australia's total workforce grew at an annual rate of 1.8% over the same period. The WA Government is in the process of developing a *Creative Industries Action Plan*.

The **NSW Government** has just appointed **Dan Rosen**, chief executive of the **Australian Recording Industry Association**, as chair of a new industry-led taskforce that will develop a 10-year action plan in support of the state's creative industries. According to Minister for Trade and Investment **Andrew Stoner**, beyond the recognised cultural and social contribution the sector could be a key driver of growth, exports, productivity, innovation and competitiveness for the NSW economy over the next decade.

## Smart ups show

However, it is the lack of available investment capital that remains the major barrier to the growth of creative industries. It is a well recognised problem, and increasingly dedicated networking events aim to overcome the disconnect between creative entrepreneurs and investors.

In October, the annual Tech23 in Sydney will, for the fourth time, bring together young entrepreneurs in the tech-space with potential investors, partners and clients. The **NSW Government** supports the event with a \$100,000 prize for the best new ICT innovations in Australia, which it sees as an investment in future long-term sources of high growth for the economy.



There have been a number of success stories coming out of Tech23, which also sources significant angel investment. Among them are:

- Cloud computing firm **OrionVM** offers a cloud based virtual data centre, in which clients can host web or internal applications – and it claims to deliver the fastest network-backed storage performance in the world;
  - **Posse** was first launched in 2010 as a social music platform that allowed bands to reward fans promoting them through social media. The company just raised \$1.2 million from US and Australian investors for a revamped business model now targeting retailers – it relaunched in July; and
  - **GoCatch** developed a smartphone application that (similar to the Ingogo innovation) connects taxi drivers directly with passenger.
- QUT's** dedicated business incubator **Creative Enterprise Australia** (CEA) runs the third annual **Creative<sup>3</sup> Forum** in Brisbane on 13-14 September 2012. The Creative<sup>3</sup> Investment

Marketplace is a networking platform in which entrepreneurs can present ideas to investors, and win a support package valued at \$100,000 to kick start a business.

Last year's winner, Sydney-based **WizzyBoard**, developed a method which allows physical objects to be recognised and localised on a touchscreen and thus integrated in online games for tablets. The company also won the top prize worth \$50,000 at a **Technology Entrepreneurship Forum**, which was hosted by the Victorian **ICT Geelong** in November 2011 and staged an investment pitching competition to help entrepreneurs commercialise IT-based ideas, concepts, start-ups and early stage projects.

### *Constraint focus*

The concept of creative industries is based on the commercial potential of arts and cultural sectors, and their growth potential facilitated through digital technologies, but there is debate on whether this focus is too narrow.

For example, **Dr Jason Potts** from the CCI proposed broadening the conceptual landscape of creativity suggesting that we should view the "creative industries" as part of a "creative

system", which is not just focused on the origination, innovation and initial adoption of physical technology, but rather on "all novel ideas". And analysing the example of South Australia, **Dr Jane Andrew** (University of South Australia) and **Associate Professor John Spoehr** (University of Adelaide) argue that creativity policy challenge requires a broader understanding of the relationship between creativity and economy, and should not just be narrowed down to the arts and the cultural sector, and should not just be seen through the lens of commercialisation and export orientation.

What it highlights is that the idea of what constitutes creative industries, or how to evaluate the significance of creativity for our social and economic wellbeing is still work in progress.

Andrew and Spoehr conclude in their paper that concepts like creativity are more rather than less likely to preoccupy researchers and policymakers over decades to come. "Translating a broad conception of creativity into an integrated strategic whole of government response is about as difficult as policy challenges can get."

*\* House Standing Committee on Economics, Finance and Public Administration; Inquiry into the current and future directions of Australia's services export sector*

# Cry me a river: update

**A** third version of the draft **Murray-Darling Basin Plan** was released in August. The altered proposal responds to comments made in July by the **Murray-Darling Basin Ministerial Council**, the Legislative and Governance Forum on the Murray-Darling Basin. While the new plan still sets a target for so called sustainable diversion limits (SDL) of 10,873 gegalitres per year (GL/y), translating to a return of 2,750 gegalitres per year (GL/y) of water to the river, it includes a mechanism that allows the MDBA to adjust this target without the need for the plan to be amended by the Parliament. This takes into account the possibility that efficiencies and savings are made through initiatives in the Basin, and will allow an adjustment of



## Money talks: the budgets

### Victoria

Decreasing revenues from GST and stamp duty have strained the spending capacity of Victorian Treasurer **Kim Wells** in his 2012-13 budget, which will still deliver a projected \$155 million for the year. R&D related spending include investments in agriculture, cancer research and manufacturing:

- \$59.6 million over 4 years for the **Victorian Cancer Agency**, which funds research into cancer and supports the development of an integrated cancer network in Victoria by 2016;
- \$61.4 million over 4 years in new funding for the food and fibre sector as part of a new **Agriculture and Food Industry Plan**, including:
  - \$19.5 million for biosecurity measures;
  - \$14.3 million into the dairy industry, with a focus on cow genetics and efficiency of feeding systems;
  - \$9 million into the beef and lamb sectors, with a focus on improved fertility, weaner survival, genetics and grazing systems;
  - \$10.6 million to focus on Victoria's grain production;
  - \$8.1 million in support of the horticultural industry (pears, almonds, stonefruits);
- \$26 million over 4 years towards a joint funding agreement with the **Australian Government** for the operation of the **Australian Synchrotron**;
- \$474,000 to Victoria Prize and Victoria Fellowship awards, which will double in number;
- a \$5 million voucher program for businesses to uptake new skills; and
- \$1.8 million for Victorian Research Scholarships for Victorian researchers to take up posts overseas.

The manufacturing industry, which contributes \$28 billion to the State's economy, will be the focus of a \$58 million 4 year investment targeting productivity networks, adoption of new technologies and innovation. The package includes

*Grinding away: Victorian manufacturers will be targeted with a \$58 million investment*



a \$24.8 million **Investing in Manufacturing Technology** program providing grants of up to \$250,000 on a competitive basis to manufacturers acquiring and integrating new technologies.

Connecting the State's business community with the rest of the world is targeted with a 4 year \$50 million **Victorian**

**International Engagement Strategy**, which is to complement a series of initiatives supporting business and manufacturing. This also includes \$18 million for programs to assist small business, with \$6.1 million allocated for Victoria's Small Business Festival.

The budget provides a further \$66 million for better water management, with \$50.4 million directed towards improved water resource measurement and management. The investment is additional to \$103 million earmarked for improved waterways and environmental waterflows.

► **More information:** [www.budget.vic.gov.au](http://www.budget.vic.gov.au)

### Western Australia

The booming, export driven economy of Western Australia sharply contrasts with that of the population rich states at the eastern seaboard, New South Wales and Victoria. In the year ending December 2011, the value of Western Australia's resources sector, which is the main contributor to the State's export, grew by over 16% to \$107 billion. And the outlook for the State's resource sector remains positive, with an estimated value of projects that are under construction, committed and/or planned totalling over \$300 billion.

Yet despite \$4.9 billion in forecast royalty revenue from mining projects, of which \$1 billion will establish a **Western Australian Future Fund**, the State's budget is marked by constrained spending. According to the WA Treasurer, this is in significant parts due to a falling share in received GST



revenue (now 55 cents from every GST dollar raised in WA).

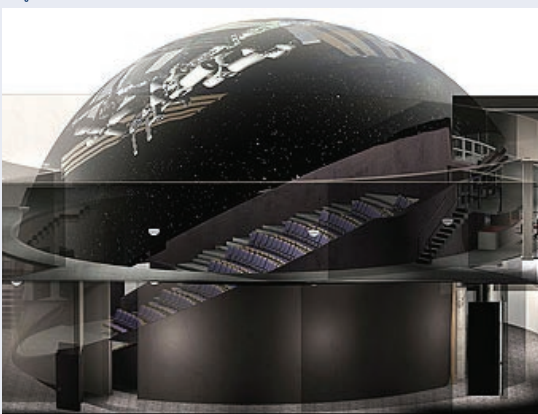
The budget projects a small surplus of \$196 million for 2012-13, but the State's debt is forecast to blow out to \$18.5 billion, despite a deferral of capital works worth \$1.8 billion to 2015-16.

Over the next 4 years, the Government will invest a total of \$26.4 billion into infrastructure, \$7.6 billion in 2012-13. A record \$1.4 billion are committed to energy infrastructure projects in 2012-13, which includes the **Mid West Energy Project**, one of the largest transmission line projects ever undertaken in Western Australia. A further \$1.1 billion in 2012-13, and \$3.6 billion over the next 4 years, will support water and wastewater infrastructure with an extra \$28 million to investigate priority groundwater sources.

The budget further provides:

- \$15 million in 2012-13 for the continuation of the \$63 million **Kimberley Science and Conservation Strategy**, which was announced in last years budget;
- \$1.2 billion or 25% from the \$4.9 billion royalty revenue from mining are for the Royalties for Regions (RfR) Fund, of which \$37.5 million over 2 years will support Phase 2 of the State's **Exploration Incentive Scheme** from 2014-15. The Government expects the second phase of the scheme to enhance the take-up of greenfields exploration acreage, with new mineral discoveries in more remote and regional areas.
- \$7.5 million over 3 years for a new **Minerals Research Institute** which will promote mineral research in Western Australia and continue on from the **Minerals and Energy Research Institute of WA (MERIWA)** scholarship program.
- \$41.5 million over 5 years for **Scitech**, WA's leading science education facility, to continue engaging the public with science.
- \$5.2million over 4 years will be used to attract distinguished researchers to carry out research of strategic importance to the State through the WA Research Fellowships Program.

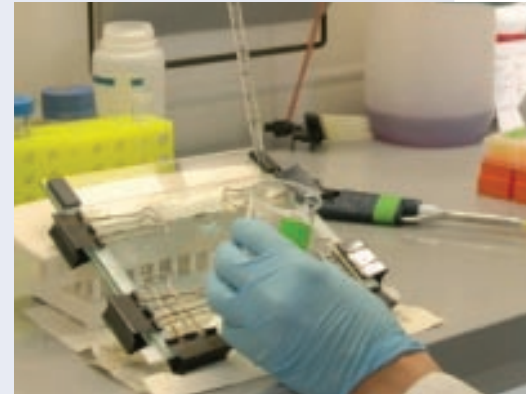
The 'Horizon' Planetarium of Perth's Scitech facility features the largest dome screen in the Southern Hemisphere.  
image Scitech, Perth



## New South Wales

With the exception of a 17% increase in infrastructure spending and a strong focus on stimulating the housing sector, financial restraint is also the predominant theme of the 2012-13 NSW budget, the second delivered by NSW treasurer **Mike Baird**. With expenditure for 2012-13 totalling \$60.5 billion, the budget will run a deficit of around \$800 million.

As expected, there are few highlights relating to R&D, but the Government did announce an annual investments of more than \$200 million for health and medical research. This coincided with the release of the *NSW Health and Medical Research Strategic Review 2012* and the Government's response to its recommendations (see 'Healthy Vision', below).



## The Office for Medical Research

will be funded with a total of \$45 million, which includes:

- \$5 million for the **Medical Research Support Program** (bringing the state's total spend on the program to \$37 million each year) to support independent medical research institutes;
- \$5 million for a new **Medical Devices Seeding** fund that will help support the development of medical devices; and
- \$3.5 million to further support the implementation of the **Health and Medical Research Strategic Review**.

The state will also contribute \$55 million in a partnership with the **Australian Government** for the **Westmead Millennium Institute**, and invest \$28 million through the **NSW Cancer Institute** for cancer research.

The primary industries received significant attention in this year's budget, with a total of \$1.1 billion allocated for the State's **Department of Primary Industries**, of which a \$100 million is set aside for **Catchment Management Authorities** and \$64 million for a **Country Towns Water Supply and Sewerage Program**. Further investment highlights include:

- \$11 million for controlling noxious weeds with activities such as herbicide resistance trials, new incursion response, serrated tussock stakeholder coordination and addressing the impact of priority widespread weeds on key ecological assets.
- \$9.8 million as the State's share of operating costs and works programs for irrigation areas to improve agricultural productivity;
- \$7.5 million to conserve and restore the Great Artesian Basin's groundwater resources as part of the continuation of the **Great Artesian Basin Sustainability Initiative (GABSI)**, which is an infrastructure renewal program funded jointly by NSW and the Australian Government; and
- \$4.8 million as the State's contribution to National Biosecurity inter-jurisdictional arrangements designed to manage risks posed by pests, weeds, diseases and contaminants.

While the NSW budget delivers \$1.4 billion for environment and heritage, including \$419 million for the management of national parks, the budget of the **Office of Environment and Heritage** will be reduced by \$55 million in recurrent expenditure and \$22 million in capital expenditure in 2012-13.

Small business will receive a boost with initiatives worth in total \$11.5 million. This includes a 50% increase in the

new **NSW Small Biz Connect** program, which was launched in February with \$5 million to provide small business support services.

► **More information:** [www.budget.nsw.gov.au](http://www.budget.nsw.gov.au)

## Healthy vision

In June, the **NSW Government** released the *NSW Health and Medical Research Strategic Review 2012*, together with its response to the review.

According to the review panel, which was chaired by **Peter Wills**, NSW currently attracts less than its population share of NHMRC funding, and there is a perception of the Government placing less value on health and medical research than its counterparts in other states.

The review adopted a ten-year horizon in developing its recommendations, which have as a major strategic aim fostering the translation and innovation from research. As the review points out, potential improvements in health, clinical care and quality and performance of health services could be a major rationale for increased investment by the Government. However, it is also a challenging goal, for which the review outlines recommendations along several broader themes, including:

- encourage research and innovation in health services;
- leadership in clinical trials;
- maximise the use of research in policy, practice and health service delivery;
- focus intellectual property expertise; and
- support early-stage venture capital;

A second strategic aim is building globally relevant research capacity, with broader themes including:

- enhance health and medical research hubs and collaboration;
- strengthen the research workforce;
- improve research infrastructure support;



- build and optimise the use of shared research assets;
- leverage all investment sources; and
- improve NSW Health research administration.

Thirdly, the review details recommendations for the establishment of a strategic investment approach.

## Money matters

In its response, the Government endorsed the recommendations of the review, strongly focussing on the potential of research translation into practical outcomes. To this end it announced an additional \$70 million over 4 years in addition to the \$200 million already spent each year on health and medical research.

Steps towards the implementation of the 10 year plan include the establishment of the **Office for Health and Medical Research**, which will implement the review's recommendations, develop a biobanking framework and establish a clinical trials support team. In addition, the Government will provide extra funding including:

- \$5 million towards changes to the Medical Research Support Program (MRSP) to drive collaboration and promote scale and sustainability;
- \$5 million per year towards the establishment of a **Medical Devices Seed Fund**;
- \$1 million towards the establishment of the **Research Capacity Building Program**;
- \$800,000 per year in collective funding for research hubs; and
- \$800,000 to support clinical research networks.

► **More information:** [www.health.nsw.gov.au/omr/](http://www.health.nsw.gov.au/omr/)

## Fast lane to the clinic

The **Australian Cancer Research Foundation (ACRF) Centre for Translational Leukaemia Research** at the **Royal Melbourne Hospital (RMH)** has officially opened and aims to fast track latest discoveries in leukemia, including recent advances in gene discovery, into clinical practice. To achieve this the centre, which is led by **Professor Stephen Jane**, provides a seamless link between clinicians and researchers from facilities such as the **Bone Marrow Research Laboratories**, the **Walter and Eliza Hall Institute of Medical Research**, and **The Royal Melbourne Hospital's Diagnostic Haematology Laboratory**.

According to Professor Jane, the model of rapidly progressing research discoveries to clinical significance could favourably impact on the diagnosis and treatment of hematological malignancy, leading to improved outcomes for patients, namely the ability to provide patient-specific therapy based on 'translational' discoveries. This could also serve as the template for the development of similar facilities investigating genetic links in solid tumour malignancies.



The centre is initially located at the RMH but eventually will move to the **Victorian Comprehensive Cancer Centre**, a \$1 billion facility purpose-built for cancer research, treatment and care in Parkville, which is expected to be completed by 2016.

► [More information: www.premier.vic.gov.au](http://www.premier.vic.gov.au)

## Defossilised perspectives

In May, **Shell's** Australian subsidiary officially opened a new \$4.8 million Biodiesel facility, which it established at its terminal in Newport (Melbourne) to launch Biodiesel



20 (B20) into the Australian market – a world first for the company. The B20 is made up from biofuels sourced from **Australian Renewable Fuels** (ARF) in Barnawartha.

According to Shell, the vegetable oil or animal fats used for the biofuel will meet sustainability standards that will enable reduction of the carbon footprint of the road transport sector in socially responsible ways.

The Newport tank and blending facility is a collaborative effort between Shell, ARF and the **Victorian Government**, which contributed \$2 million to the project. It will have capacity for an annual distribution of up to 50 million litres of biodiesel into Victoria's retail distribution channel.

► [More information: www.shell.com.au](http://www.shell.com.au)

## Its all for the pudding

The **Victorian Government** announced grants of up to \$1.5 million for 6 Victorian businesses to undertake a *Proof of Concept* study of their products, processes and services that meet the future technology needs of State Government agencies, with the potential for wider markets.

The projects selected in the second round of the \$28 million **Smart Small and Medium Enterprises Market Validation Program** (Smart SMEs MVP) cover technology areas such as medical devices, material science, pharmacogenomics, fibre optics and telemedicine. This will

build on the projects supported in the first round of the program, which are currently underway developing solutions in renewable energy, health, transport and environment.

Selected project in round two of the Smart SMEs MVP include:

- **Osprey Medical** will work with **Melbourne Health** to develop an antibiotic delivery system to manage diabetes related foot disease;
- **Genes FX** will work with **Melbourne Health** to develop an innovative drug safety system to reduce adverse reactions;
- **Hawk Measurement** will work with **Melbourne Water** to develop innovative fibre optic solutions for water pipelines;
- **APS Innovations** will work with the **Royal Children's Hospital** to develop a specialised infant feeding teat for both healthy and difficult feeders;
- **Ingenuis** will work with the **Royal Victorian Eye & Ear Hospital** to develop a portable slit lamp for use in the treatment of glaucoma; and
- **Alcidion** will work with **Western Health** to develop an innovative software platform for management of patient stays in hospitals.

► [More information: www.premier.vic.gov.au](http://www.premier.vic.gov.au)

## (Bio)secure opening

A \$57 million **Centre for Biosecurity** was launched at the **Elizabeth Macarthur Agricultural Institute** (EMAI) in Sydney. It

will house more than 180 staff and allow researchers to test for diseases such as swine flu, equine influenza, Hendra virus and citrus



*Aerial photo of the Elizabeth Macarthur Agricultural Institute, Camden, Sydney – the only high containment animal, plant and aquatic bio-security diagnostic facility in NSW.*  
image: NSW Public Works

canker. Its features include:

- new high level containment facilities for handling large scale emergency disease outbreaks and plant biosecurity facilities for plant disease emergencies;
- world class virology, bacteriology, microbiology and molecular biology laboratories;
- upgraded animal and plant health facilities to meet current regulations and standards; and
- upgrades to site infrastructure including waste management, power, gas, site security and stormwater management.

► [More information: www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)

## ...with tough measures

The **NSW Parliament** has amended the State's biosecurity legislation to improve the protection of the State's \$9 billion Primary Industries sector and environment from potential pests and diseases. The *Primary Industries Legislation Amendment (Biosecurity) Bill 2012* was passed in May.

According to Primary Industries Minister *Katrina Hodgkinson*, the changes give the **NSW Government** new powers to manage the movement of plants and animals, and undertake additional disease monitoring and surveillance. They also allow for the destruction of suspect plants and animals, and introduce new measures that require landholders and members of the community to notify authorities of potential animal and plant diseases.

► [More information: www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)

## Wet advances

### ...in NSW...

The **Sydney Institute of Marine Science (SIMS)** was officially opened in May, after a more than \$20 million make-over. New features include a new aquarium facilities, new cell and molecular microbiological, field biology and geological laboratories, refurbished teaching laboratories, new lecture theatres and conference centre.

The upgrade was made possible with financial and in kind contributions from governments, private organisations and philanthropic foundations.



*Above: The Sydney Institute of Marine Science (SIMS) hosts the NSW-IMOS Science Node and operates a number of the IMOS infrastructure facilities such as NSW moorings, the Autonomous Underwater Vehicle (below) and Animal Tagging and Monitoring.*

Images: SIMS and Australian Centre for Field Robotics



The multidisciplinary research at SIMS will be across five core research themes – Urbanisation, Biodiversity, Climate Change, Ocean Resources, and Marine Management. SIMS is also the operator of the NSW node of the **Integrated Marine Observing System (IMOS)**.

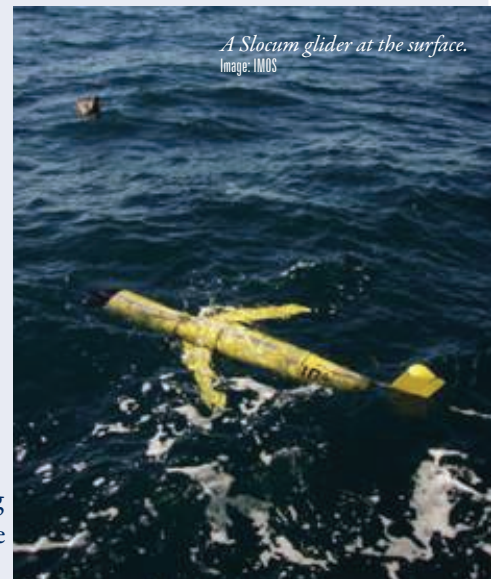
► [More information: www.sims.org.au](http://www.sims.org.au)

### ...and WA

Research at the Western Australian node of IMOS will be funded with \$6 million over 3 years from the State's Government. IMOS conducts climate and marine research in the oceans off the Pilbara and the Kimberley coasts using a new array of moored buoys, acoustic listening stations and ocean gliders.

Piloted by the **Australian National Facility for Ocean Gliders** at **The University of Western Australia (UWA)**, the gliders are providing information about the three-dimensional structure of the ocean below the surface.

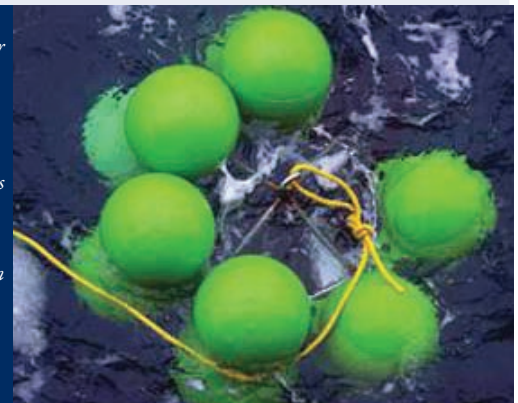
The **Australian Institute of Marine Science (AIMS)** is operating the moored buoys off the WA coast at a depth of 50 to 400 metres, where they measure ocean temperature, salinity, currents and water quality. And later this year, **Curtin University** will deploy the acoustic listening stations to provide



*A Slocum glider at the surface.*  
Image: IMOS

*IMOS Deep Water Moorings facility (also known as the Australian Bluewater Observing System or ABOS) provides the coordination of national efforts in the sustained observation of open ocean properties with particular emphasis.*

image: IMOS



new information on ocean phenomena such as movements of whales and fish.

► [More information: www.mediastatements.wa.gov.au](http://www.mediastatements.wa.gov.au)

## Woom-boom now woom-gloom?

In the [ARDR Apr-May 2011 edition](#), we provided an extensive review of Australia's mining industry, with particular emphasis on the rising fortunes of the South Australian industry. Our



image: Charlie Brewer; accessed from flickr under creative commons license 2.0.

review included the anticipated (and now stalled) expansion of **BHP Billiton's Olympic Dam** mine, but our main focus was on the **Australian Government's** plan to open the **Woomera Prohibited Area (WPA)** for mining exploration.

Two thirds of the WPA is South Australian crown land, but given the potential scale of the resource deposits in the WPA, the step has national significance – it is estimated that over the next decade the WPA could have some \$35 billion worth of development, including iron ore, gold and uranium. Given the recent decision by BHP not to go ahead with its planned expansion of Olympic Dam, there is now a question mark over when, if at all, this potential may be realised.



In August, BHP Billiton announced that it would not go ahead with a planned US\$30 billion expansion of its Olympic Dam mine in South Australia. The decision was made on the back of a 35% drop in net profits and falling commodity prices.

Still, in May last year a review by **Dr Allan Hawke** detailed a comprehensive management framework for an improved coexistence of industry and defence in the WPA. Following on from this, the Australian Government released a standardised *Deed of Access* for public comment in April and the submissions are now considered. The step is to provide interim arrangements for companies to access the WPA until the framework of coexistence is legislated.

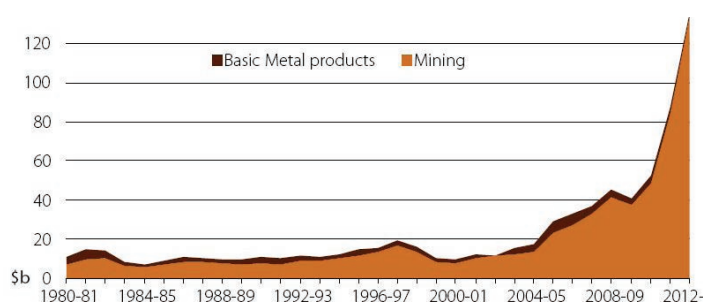
Once the *Deed of Access* and supporting processes are finalised, companies will be allowed to apply for access to the WPA based on the coexistence framework.

► **More information:** <http://minister.ret.gov.au/MediaCentre/MediaReleases/Pages/WoomeraProhibitedArea.aspx>

## ...as investments keep flowing

As detailed in a paper *Mining Industry Major Projects - April 2012* by the **Bureau of Resources and Energy Economics (BREE)**, at the end of April capital [investments](#) in Australian mining were at a record level, with \$260.8 billion committed to 98 projects including 39 minerals projects, 38 energy projects, 19 infrastructure projects and two mineral processing projects.

The vast majority of the investment is in Western Australia (\$135 billion) and Queensland (\$75 billion). By comparison, despite its great mining potential South Australia shared less than 1% (~\$1.4 billion) of this investment.



New capital expenditure 2011-12 dollars  
BREE report Mining Industry Major Projects April 2012

[In fact, this sobering outlook has been [picked up](#) in a report from the **South Australian Centre for Economic Studies**, which states that the State is not experiencing a 'mining boom', although a decision by **BHP Billiton** to go ahead with the \$20 billion Olympic Dam mine expansion would have significantly lifted the State's share of advanced new mining projects to around 9%.]

The BREE report shows that between April 2011 and April 2012 capital expenditure on Australian mining projects increased by 34%, driven by final investment decisions on major LNG projects – the **Wheatstone, Prelude, APLNG** and **Ichthys** projects, and the \$2.5 billion first Phase of the **Greater Western Flank** project as part of the **North West Shelf** project. The investments also include a \$5 billion cost increase of the **Curtis Island LNG** project and **Rio Tinto's** mineral project, the **Nammuldi** iron ore mine expansion.

Oil and gas, iron ore and coal and associated infrastructure account for around 95% of the total committed capital expenditure, with over 60% committed to seven LNG projects.

In the six months to April 2012 the \$15 billion Pluto LNG project was completed, one of 25 projects completed during the period at a record value of \$23.6 billion. This was almost double the previous record value when \$12.5 billion worth of projects was completed in the six months to April 2008.

The BREE report further highlights new capital expenditure in the mining industry, the highest on record in 2010-11 totalling \$52 billion, and is projected to increase further in 2011-12 to more than \$84 billion.

Another measure highlighting the continued strength of the mining sector are the expenditures in mineral exploration,

which totalled \$6.4 billion in 2010-11, the second highest on record and double the average expenditure in real terms compared to the previous 30 years. However, the major portion of this targets brownfields projects, which are expansions to existing operations, while expenditure on energy, particularly petroleum, declined.

► **More information:** [www.bree.gov.au](http://www.bree.gov.au)

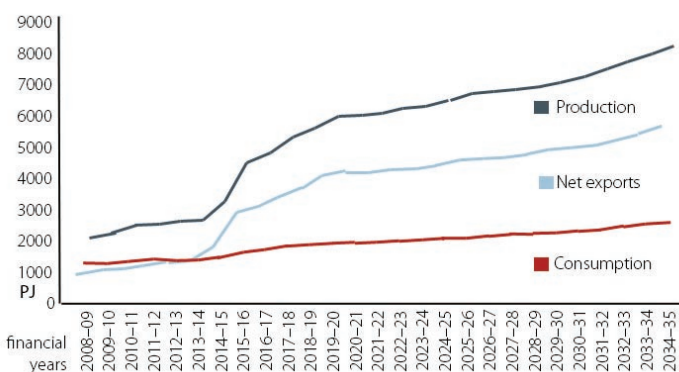
### ...not only here but elsewhere

Despite recent falls in commodity prices, the commodities sector is booming not only in Australia but globally. Thus investments of more than \$260 billion in minerals exploration and development have been announced in Chile, Peru and Colombia. As Industry and Innovation Minister **Greg Combet** pointed out in a Government statement, this could also provide opportunities for Australia. On a recent trip to Latin America, **Peter Beattie**, the Government's Resources Sector Supplier Envoy, identified an estimated \$45 million worth of potential contracts for Australian mining suppliers.

► **More information:** <http://minister.innovation.gov.au/gregcombet>

## Gaseous future (at a cost)

Australian wholesale gas prices could rise sharply over the short to medium term as prices converge with international markets and coal seam gas wells ramp up to full production from 2014, predicts the **Bureau of Resources and Energy Economics**



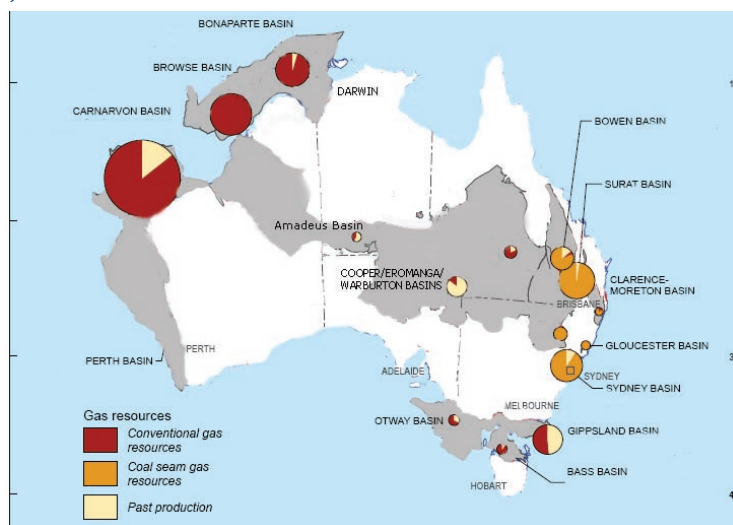
*Set for growth - Australia's gas production, consumption and exports projected out to 2034-2035.*

Figure adapted from [bree.gov.au](http://www.bree.gov.au) 2012 Gas Market Report

(BREE) in its first *Gas Market Report*, which will be updated annually. BREE also released an *Australian Gas Resource Assessment 2012*, which will contribute to the final phase of the Energy White Paper process, which is expected to be released at the end of this year (for key messages see figure below).

The *Gas Market Report* forecasts that Australia could become the world's second largest LNG exporter by 2015, and this, rather than changes in Australia's own consumption, will change the industry significantly over the short and long term, particularly in eastern Australia.

Gas consumption is set to increase over the next two decades, as non-OECD economies experience strong economic growth and shift away from coal to gas for electricity generation. A similar shift towards gas, driven by a price on carbon, is also expected



*Australian Gas Resources 2012 key messages:*

- Gas is Australia's third largest energy resource after coal and uranium, and resources are large enough support projected demand (export and domestic) to 2035 and beyond.
- Most of the conventional gas is found off the north-west coast of Australia, while significant coal seam gas resources are in the major coal basins of eastern Australia.
- Significant shale gas and tight gas resources are likely but have yet to be quantified.
- Being relatively flexible and clean, it is projected to be the fastest growing non-renewable energy resource until 2035, and will increasingly contribute to electricity generation and exports.

for domestic consumption.

Australian exports could triple from currently 20 million tonnes to over 63 million tonnes in 2016-17, and then continue to increase further until the end of the decade.

While construction costs are relatively high in Australia, the proximity to Asian markets and low sovereign risk have attracted investment. At present, two thirds of total world LNG liquefaction capacity under construction is located in Australia, and this will underpin Australia's rise to become the world's second largest exporter behind Qatar by 2015.

The main export markets are Japan and the Republic of Korea, which are totally reliant on LNG imports. But it is China that is set to become increasingly important, although this prediction has some risks. The US was thought to become a large importer of LNG, but on the back of technological advances and despite environmental concerns, they were able to triple their production of shale gas between 2007 and 2010, and require very little LNG import.

### *It's all in the shale...*

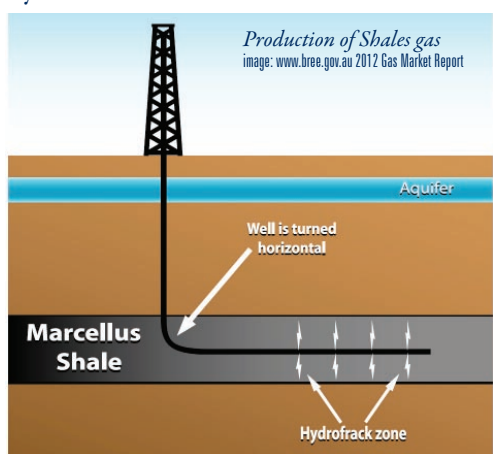
Shale gas, like coal seam gas, is an unconventional gas resource contained within organic-rich source rocks such as shales and fine-grained carbonates. China is believed to have far more shale gas resources, around 36 tcm, than the US with an estimated 24 tcm. However, while China's industry is in its infancy, its shale gas is less accessible than in the US and hence less economical to recover.

Global estimates that proven world gas reserves are at

187 trillion cubic metres (tcm), lasting around 59 years at current production levels. Estimated recoverable gas resources are at around 810 tcm, which would last some 250 years at current production rates. Approximately half of this is from unconventional gas resources such as coal seam gas, shale gas and so called tight gas.

### ...the next big thing?

Australia has significant resources of shale gas too, although none is yet economic demonstrated resource. Current estimates by **Geoscience Australia** are at 11.23 tcm of shale gas resources,



twice as large as CSG resources, with prospective areas located in South Australia's Cooper Basin, a region not likely to raise competition issues experienced with CSG. The region may also raise less environmental

concerns related to groundwater contamination during production. The report predicts that shale gas could become a significant source of gas over the longer term (for a more detailed article on recent shale gas developments we recommend a [recent article](#) by Tim Treadgold in The Australian newspaper).

► [More information: www.bree.gov.au](http://www.bree.gov.au)

## Riding the waves

Wave energy is one of the still fairly underexplored renewable energy options in Australia. Last year, as part of the *Garnaut Climate Change Review*, the **CSIRO** [examined](#) our potential for harnessing wave energy. It concluded that to supply in the order of 5% of Australia's total grid based electricity demand by

2050, it would, based on current technology developments, require around 100 kilometres to 200 kilometres of coastline, segmented into a number of regions.

Most of the current innovations for harnessing wave energy – the CSIRO estimates there are around 200 so called wave energy converters (WEC) in development – are centred in Europe and to a lesser extent in the US. Only few are in

Australia, despite having some of the world's best resource along the country's Southern coastlines. Just the 25 metre depth isobath between Geraldton and the Southern tip of Tasmania could provide over 1300 terrawatt hours of power per year, about five times the nation's total electricity requirement.

The report concluded that wave power could become economically viable, particularly along the southern coast line and the west coast of Tasmania. This will require, however, some reduction in the current capital and operations and maintenance costs.

The largest wave power project in Australia and globally one of the largest to date, a 19 megawatt (MW) wave-energy project in Victoria's Portland, will be undertaken by US-based **Ocean Power Technologies** (OPT) and partners. In 2009, Australian special purpose company **Victorian Wave Partners**, which is wholly owned by OPT, received a \$66.5 million grant through the **Australian Government's** \$435 million **Renewable Energy Demonstration Program** (REDP), although conditional on significant additional project funding. In July the project took an important step forward when OPT [announced](#) a teaming agreement with aerospace and advanced technology company

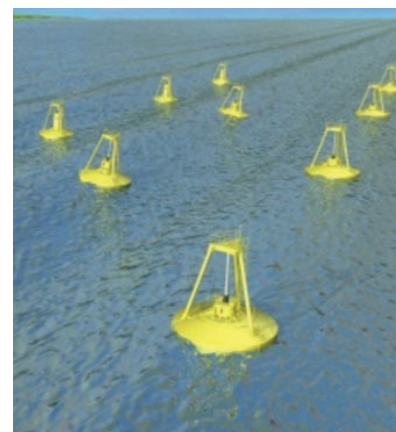
**Lockheed Martin**

Under the agreement, Lockheed Martin will assist the project, including by leading the production and system integration of the wave-energy converters as well as supporting overall program management.

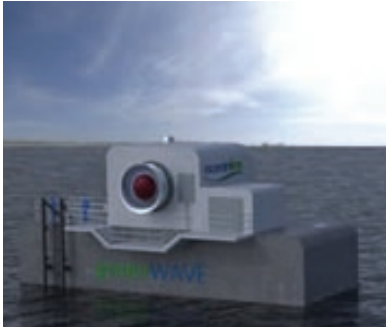
In Australia, the most advanced projects are the **OceanLinx** Oscillating Water Column (OWC) technology and **Carnegie's** wave energy innovation CETO, but there are new promising developments, such as Sydney based **BioPower Systems** established in 2006. All three projects recently received support through major grants from the \$126 million **Australian Government's Emerging Renewables Program** (ERP).

[Announced](#) in July, OceanLinx was awarded around \$4 million from the ERP, which contributes to a \$7 million commercial scale plant in South Australia. The project will use the company's GreenWAVE technology which has a capacity of around 1MW of power. OceanLinx' device operates in shallow

*The rise and fall of waves causes the OPT buoy to move freely up and down, which drives an electrical generator. The generated wave power is then transmitted ashore via an underwater power cable*



OceanLinx greenWAVE (top) and blueWAVE (bottom) technologies. Both are fixed to the seabed, but the greenWAVE operates in shallow water, is smaller and a single unit, compared to six oscillating wave columns in the blueWAVE option for deep waters.



water with no underwater moving part, generating electricity as a rising wave pushes a column of air past a turbine located above sea level, and as it recedes sucks the air back thus generating power in both directions.

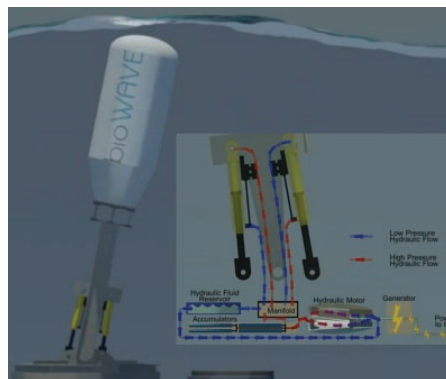
The company claims it is the only one in the world in this sector with a complete end-to-end solution, and the project could be the world's first on this scale to be connected to the grid.

But OceanLinx also battles some negative headlines. In 2009, a prototype sunk in rough

waters and, as [reported](#) in the Illawarra Mercury in April, a Wave to Energy generator at Port Kembla (NSW), which was decommissioned in 2009, is still to be removed while rusting away in the surf.

By contrast BioPower's bioWAVE unit is designed to survive the severe forces of the Southern Ocean while generating up to 250-kilowatt of electricity transported to the grid via subsea cable. BioPower will establish a \$15 million pilot plant off the coast of Victoria, supported with \$5.6 million from the ERP and a further \$5 million from the **Victorian Government**.

The company says the design of its device is inspired by



The bioWAVE is mounted on the seafloor, with an array of buoyant floats ('blades') that interact with the rising and falling sea surface and the sub-surface back-and-forth water movement swaying the pivoting structure at the bottom back-and-forth.



Published in the Illawarra Mercury: The Oceanlinx Wave to Energy generator plant at Port Kembla.  
Image: KIRK GILMOUR

nature and capable of avoiding excessive wave forces, with its current prototype to be placed at a depth of 30 metres. Following assembly of the 400-tonne unit in 2013, the pilot is scheduled to operate to late 2015.

Carnegie's CETO technology, which has been frequently covered in the ARDR, will



The CETO technology differs from the wave energy system in that the power converter is fully submerged and produces high pressure water from wave movements driving a turbine on land for electricity generation. The units are also capable of producing desalinated water.

IMAGE: Carnegie

receive almost \$10 million in funding through the Emerging Renewables Program, as [announced](#) in early May. The grant will go towards the company's \$31 million **Perth Wave Energy Project**, the first grid connected project using the technology. Carnegie secured further support of \$5.5 million from the **Western Australian Government** and a significant \$16 million in equity funding, which prompted the Carnegie's board to go ahead with the project at Western Australia's Garden Island. The project will have an initial capacity of up to 2MW, with the potential to be expanded to 5MW. It is expected to feed into the State's grid at the end of 2013, and if everything goes to plan it will provide Carnegie, after a decade of development, with its first revenue from a wave project.

► **More information:** <http://minister.ret.gov.au/MediaCentre/MediaReleases/Pages/AustraliaMakesWavesRenewableEnergy.aspx>

## Farmed mitigation

The **Australian Government** [announced](#) the outcome of two new grant schemes that are part of its **Clean Energy Future Plan** – the \$201 million **Filling the Research Gap** and the up to \$99 million **Action on the Ground** programs. Both programs are components of the **Carbon Farming Futures Program**, a \$429 million over 6 years initiative, which includes three additional elements, a \$20 million **Converting Research into Methodologies** program, a 15% **Refundable Tax Offset (RTO)** for new conservation tillage equipment, and a \$64 million **Extension and Outreach** program.

The grants announced in May are worth a total of \$72.5 million. This includes \$47.3 million provided through the Filling of the Research Gap program, which will support 58 projects broadly addressing the key areas of agricultural methane and nitrous oxide emissions, soil carbon and improvements in modelling capability.



While the use of fertilisers is a major source of the potent greenhouse gas nitrous oxide, biochar (shown in insert) not only can improve soil health and water storage capacity, as well as sequester carbon into soil - it may also help reduce nitrous oxide emissions from soil, as is [investigated](#) by research at the University of Western Australia.

Image: biochar - University of Western Australia

Under the Action on the Ground program, \$25.2 million were awarded to 59 projects that will trial and demonstrate a range of on-farm technologies and innovative practices that target carbon storage, agricultural greenhouse gas emissions and farm productivity.

One option to reduce agricultural greenhouse gas emissions is the use of biochar, a stable type of char made by heating organic materials, such as wood or crop waste, in a low oxygen environment. Added to soil, biochar can improve soil health and water holding capacity. The Government's Carbon Farming Initiative, a \$46 million reward scheme for reducing farming related emissions, includes a special **Biochar Capacity Building Program** (BCBP) that supports research into how farmers can use biochar to reduce their carbon emissions footprint. In April, 5 projects were awarded \$2 million under the program.

► [More information: www.daff.gov.au/climatechange/carbonfarmingfutures](http://www.daff.gov.au/climatechange/carbonfarmingfutures)

## Genes in the bank

A new national seed bank, the **Australian Grains Genebank**, will be established at the **Grain Innovation Park** in Horsham, Victoria, to consolidate tropical and temperate climate cereal, grain legume and oil seed collections currently held in multiple facilities throughout Australia.

The initiative, a joint partnership between the **Victorian Government** and the **Grains Research and Development Corporation** (GRDC), will hold more than 180,000 samples from Australia and around the world



*The Horsham Grains Innovation Park*  
image: Department of Primary Industries, Victoria

According to Agriculture and Food Security Minister **Peter Walsh**, Australian plant breeders can access the genetic material and associated international knowledge necessary to produce superior varieties.

“Grain growers can also capitalise on new market opportunities based on growing demand for grains, as well as respond to any emerging environmental and climate challenges and pest and disease outbreaks.”

The Victorian Government and the GRDC will each invest up to \$2.85 million into new Genebank facilities, glass houses and infrastructure upgrades at Horsham, and each commit up to 600,000 for 5 years towards the annual operating costs of the expanded Grain Innovation Park.

► [More information: www.premier.vic.gov.au](http://www.premier.vic.gov.au)

*...continued from page 13*

to strengthen the national food system, against which various avenues of actions are explored that could lead to new market opportunities.

While food security per se is not a major issue in Australia, the Government seeks input on measures that identify and mitigate potential risks in the future. Measures discussed include the periodic publication of a *State of the Food System* report on food production capacity and security.

With the potential threats posed by climate change, the Government seeks to foster more sustainable food production through innovation in farming and fishing practices, and better collaboration between industry, communities and governments for targeted investments in natural resource management.

Another issue tackled concerns the ongoing community concerns of major mining projects competing with food production, although less than 1% of Australia's farmland is forecast to be affected by coal seam gas operations. The paper highlights that \$200 million of federal money is committed towards the management of such potential conflicts.

Equally conscientious is foreign investment in food production, but the Government stresses its view that any reduction in investment is likely to lower food production. However, it details measures to improved transparency of foreign investment in agriculture, including through 2-yearly data collection by the **Australian Bureau of Statistics** and an expanded **Agricultural Census**.

Further issues discussed in the Green Paper relate to concerns about the dominance of major player in the supply chain, the relationship of nutrition and health, measures to ensure safety of food, and Australia's role in global food security.

► [More information: www.maff.gov.au](http://www.maff.gov.au)

## *Grow more with less land?*

Global food security, and growing competition for land, water and natural resources will also be discussed at the **Crawford Fund** 2012 Parliamentary Conference in Canberra, 9-10 October, 2012. The conference in the Fund's 25th year is entitled *The Scramble for Natural Resources: More Food, Less Land?*

And further in relation to food security, the Government announced in October last year a commitment of more than \$36 million to set up an **Australian International Centre for Food Security**. The new centre is led by **Australian Centre for International Agricultural Research** (ACIAR) and will provide agricultural research and advice to developing countries across Africa, Asia and the Pacific region – initially focussing on African countries.

► [More information: http://aciarc.gov.au/aifsc](http://aciarc.gov.au/aifsc)

## Clouded threats

US-based **Science Applications International Corporation** (SAIC), a global provider of scientific, engineering, systems integration and technical services and solutions, will set up a regional R&D centre in Melbourne. The new office will focus on global challenges in national security, energy and environment, health and cyber security.

According to the Victorian Minister for Manufacturing, Exports and Trade **Richard Dalla-Riva**, the growing shift towards cloud computing, use of high speed broadband networks and increased threats of cyber attacks is leading to a new need for cyber security development.

SAIC's Melbourne R&D centre will support its dealings with Government and industry clients, but also focus on new opportunities around the **National Broadband Network** (NBN).

► [More information: www.premier.vic.gov.au](http://www.premier.vic.gov.au)

## Revived champion

The **Queensland Government** has relaunched **Software Queensland** as **IT Queensland**, to continue its work as a champion of Queensland ICT companies under a new banner and with a broader focus.

► [More information: www.itqueensland.com.au/](http://www.itqueensland.com.au/)

## Webbed business

Australian businesses continue to increase their use of information technology and the internet, with a marked increase in e-commerce. According to a recent survey by the **Australian Bureau of Statistics**, in 2010-11 businesses earned \$188.7 billion through orders received via the internet, a 32% increase over the previous year (\$142.8 billion).

The ABS data show that 91.2% of all businesses had internet access in 2010-11, compared to 90.1% in the previous year, and over 99% of those with internet access used broadband as the main type of connection (97.1% in 2009-10). There was also a slight increase in the number of businesses maintaining a website – 43.1% of businesses had a webpresence in 2010-11 compared to 40.0% in 2009-10, although this is still low by OECD standards.

Australia's economy has a high proportion of smaller sized businesses, and the smaller they are the less likely it is they present themselves on the web.

Just 33.2% of businesses with 0-4 persons and 53.8% of businesses with 5-19 persons have a web presence, compared to 74% of businesses with 20-199 persons and 97.3% of businesses with 200 or more persons.

Government initiatives such as the [digitalbusiness.gov.au](http://digitalbusiness.gov.au) website, which provides practical assistance to building up a digital business, have not yet been able to change this pattern significantly, leaving micro and small sized business at risk of missing out on the rapidly increasing trade online.

Size matters, as does the type of business in the digital world. Businesses in the sectors Wholesale Trade and Manufacturing, which are usually selling physical goods, had the highest proportion of businesses receiving orders over the internet (52% and 50% of businesses, respectively). Leading at the low end of the scale are the sectors Agriculture, Forestry and Fishing, of which only 13% had a web presence and just 12% of businesses received orders via the internet, followed by Health Care and Social Assistance and Mining.

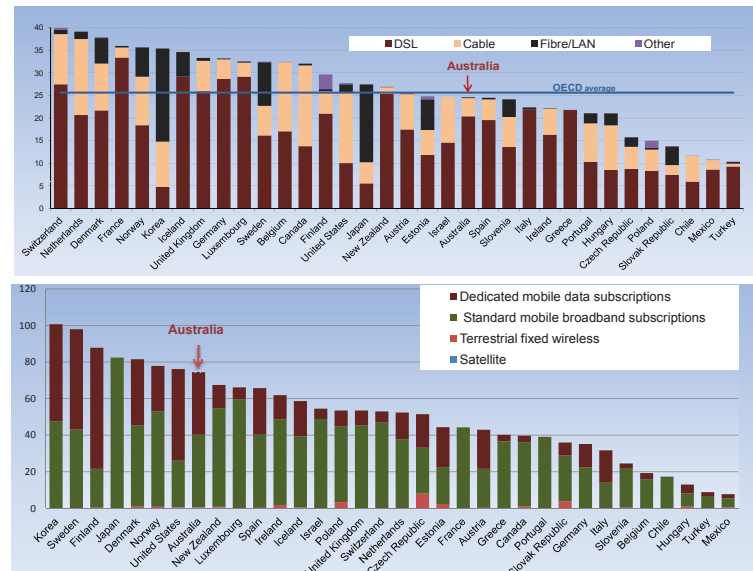
► [More information: www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/19D1D0B8970BCBE8CA257A2800145B5A?opendocument](http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/19D1D0B8970BCBE8CA257A2800145B5A?opendocument)

## Fixed avoidance

A recent analysis of broadband subscriptions in OECD countries underscores the strong growth in mobile internet services in Australia. While the OECD ranks Australia 21st out of 34 countries for fixed line broadband penetration which,

*Australia's ranking in the OECD for: fixed broadband subscriptions (top panel); and mobile broadband subscriptions (bottom panel).*

credit: figure adapted from OECD



according to Telecommunications Minister Stephen Conroy, reinforces our need for the NBN, Australia is ranked 8th in wireless broadband subscriptions, and 5th in dedicated mobile data subscriptions.

► [More information: www.minister.dbcde.gov.au](http://www.minister.dbcde.gov.au)

*feasting on data*

Cisco has released its sixth annual *Cisco Visual Networking Index (VNI) Forecast (2011 - 2016)*, according to which global



Internet traffic will grow 4-fold in the 5 year period to 2016.

However, while the data exchange over fixed internet will expand 3-fold, mobile traffic will increase 18-fold between 2011-2016, and increase its share of total data traffic from 2% in 2011 to 10% by 2016.

The region growing fastest in internet traffic is the Middle East and Africa, followed by Latin America.

For Australia, total Internet traffic is forecast to grow 5-fold during the period, but as for global internet use, Australia will also see a marked increase in the share of data exchanged through mobile devices, with mobile internet traffic expected to be 14-times as large in 2016 than it was in 2011.

► [More information: http://www.cisco.com](http://www.cisco.com)

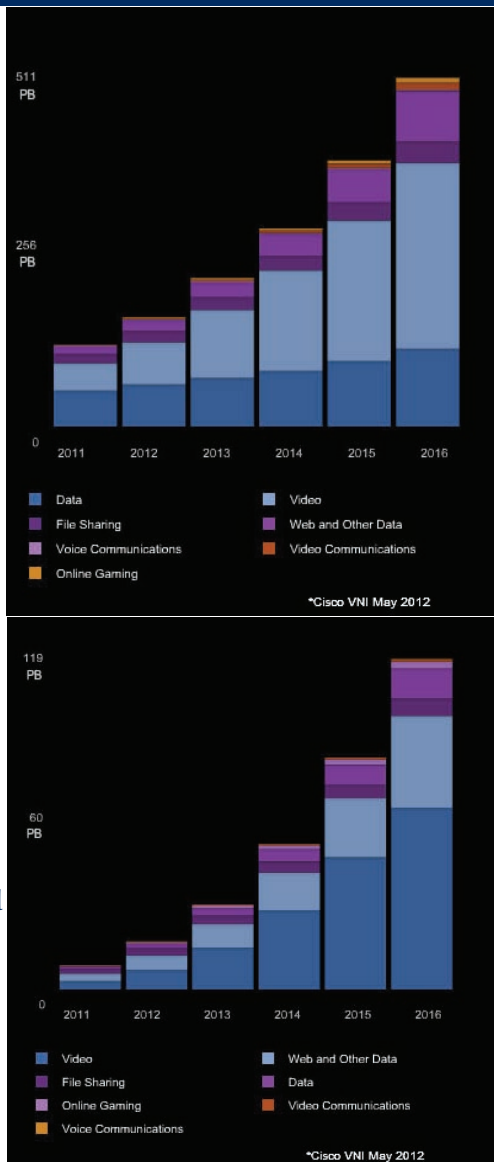
## Keep the doors open

At the end of March, the **Australian Parliament** passed [legislation](#) to establish the **Telecommunications Universal Service Management Agency** (TUSMA). The new statutory agency will administer managing contracts or grants with telecommunications service providers and ensure the Australian public has reasonable access to universal telecommunications services.

This includes the delivery of the Universal Service Obligation which requires that standard telephone services, payphones and prescribed carriage services are reasonably accessible to all people in Australia on an equitable basis.

TUSMA will put in place arrangements to meet the costs of connections to the NBN fibre network for voice-only customers.

In June, Telecommunications Minister **Senator Stephen**



Internet traffic growth in the 5 year to 2016. Top panel: total traffic growth (fixed-line and mobile) is expected to grow 5-fold; Bottom panel: mobile traffic will increase 18-fold over the period  
Graph prepared with Cisco VNI Forecast Widget

**Conroy** [announced](#) the first appointments to TUSMA. **Peter Harris**, secretary of the **Department of Broadband, Communications and the Digital Economy**, will serve as acting chair for three months. Other members include **Cameron O'Reilly** and **Rosemary Sinclair** (appointed for four years); and **Keith Gomes**, **Nicole Rich**, and **Desley Boyle** (appointed for three years).

► [More information: www.tusma.gov.au/about](http://www.tusma.gov.au/about)

## Ordered superflop at peta scale

**Fujitsu Australia** will build a 1.2 Petaflop supercomputer for the **National Computational Infrastructure** (NCI), which is hosted by the **Australian National University** (ANU).

In June, the university [announced](#) that it has signed a respective agreement for the \$100 million investment, of which \$50 million will be from the **Australian Government's Super Science** initiative. Expected to be launched in 2013, the supercomputer will be the most powerful in the Australian research sector, with computing power, memory and storage of about 30,000 dual-processor computers working in tandem, capable of performing 170,000 calculations per second.

ANU vice-chancellor **Professor Ian Young** said in a statement that the infrastructure will provide Australia with

a much-needed capability to meet national challenges, particularly in areas of research where deeper insights rely upon higher performance computation.

NCI is funded by the **Australian Government**, through its **National Collaborative Research Infrastructure Strategy**, and partner organisations that include the ANU and **CSIRO**, the **Bureau of Meteorology**, **Geoscience Australia**. Its mission is to provide Australian researchers with high-end computing services.

► [More information: http://news.anu.edu.au/?p=15551](http://news.anu.edu.au/?p=15551)

*...as teraflops are making for the stars*  
**Swinburne University of Technology** launched its new \$3 million **GPU Supercomputer for Theoretical Astrophysics**, (gSTAR), which will be capable of modelling entire universes.

The 120-teraflop supercomputer will be at least 10x faster than its predecessor and is one of only six such machines in Australia. It was built employing the same graphics processing



image: ANU

units (GPUs) used in personal computers and game consoles. By contrast to traditional supercomputers, which rely on central processing units (CPUs) to process information, the gSTAR uses GPUs that can perform numerous high-speed tasks at once.

The system is supported by a quad data rate (QDR) InfiniBand network that transfers data to GPUs and large memory nodes, each with 512 gigabytes of memory.

**Professor Warrick Couch**, who is director of the **Swinburne Centre for Astrophysics and Supercomputing**, said in a university statement that GPUs will make a major contribution to processing data from new optical and radio telescopes, such as **SkyMapper** in NSW and the **Australian Square Kilometre Array Pathfinder** in Western Australia.

► **More information:** [www.swinburne.edu.au](http://www.swinburne.edu.au)

## (Ad)dress up

In case you haven't noticed (and chances are you haven't):

On 5 June 2012 many major internet websites and internet

service providers took a generational leap towards the next generation internet protocol IPv6.

According to the official website of the World IPv6 Launch, which was organised by the **Internet Society**, thousands of companies and millions of websites have now permanently enabled the new protocol, a necessary evolution after the billions of IT

hardware in use on the planet have

exhausted the around 4.3 billion IP addresses provided under the old IPv4 protocol. The new IPv6 protocol will extend this to approximately  $3.4 \times 10^{38}$  addresses, essentially allowing the internet to grow indefinitely.

Participants in World IPv6 Launch included the four most visited websites in the world – Google, Facebook, YouTube, and Yahoo! – as well as home router manufacturers and Internet Service Providers in more than 100 countries. In Australia, internet service providers such as Telstra, Optus, iiNet, Internode and Pipe Networks have also upgraded to the new protocol.

► **More information:** [www.worldipv6launch.org](http://www.worldipv6launch.org)



World IPv6 launch logo  
image: wikipedia; creative commons 3

*...continued from page 21*

the surface water recovery within a range of at least between 2,400 GL/y and 3,200 GL/y.

In the new proposal, the MDBA has also slightly increased the amount of groundwater that can be extracted, setting the overall groundwater SDL at 3,324 GL/y, compared to 3,184 GL/y in the previous version.

According to the rules set out in the Water Act, the process has now reached the stage at which the Australian Government can unilaterally direct the final steps towards the plan. And while Minister Burke pledged that he would continue to cooperate with the Basin States, he also said that he is prepared to use his legal mandate to get the plan in place by the end of this year. "Consensus has failed for a century so I don't rule out using these legal powers in the future", Minister Burke said.

This third proposal is still controversial among state governments and scientists. South Australia continues its threat of a High Court challenge if the target for surface water SDL is not lifted towards 4,000 GL/y, while NSW and Victorian Governments aim for a lower target of 2,100 GL/y.

There was also strong criticism from the **Wentworth Group of Concerned Scientists**, who released an evaluation of the proposed basin plan in August. "This latest version reinforces the fact that if you start with shoddy foundations you will end up with a shoddy house. In the case of the proposed Basin Plan, some things get worse with each iteration," the scientists state (see box for specific points the Wentworth Group raised in their evaluation).

*Summary of points raised by the Wentworth Group of Concerned Scientists in an evaluation of the August 2012 draft Basin Plan include:*

- The Plan does not identify how much water must be returned to achieve a healthy working river and comply with the Water Act.
- No scientific justification has been given for why 2,750 GJ is the proposed reduction in water extractions. This number will still not achieve the majority of targets required for a healthy working river.
- The Plan requires the preparation of a constraints management strategy 12 months after the commencement of the Plan. This will be critical information that must be considered by the Parliament before making a decision on the Basin Plan. It will be of little use 12 months after the Parliament makes an uninformed decision.
- Ground-water extractions are to increase by over 1,700 GJ from current levels. Nowhere is it made clear why this resource should be given away in such huge amounts without a clear and defined need.

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