The Dow Chemical Company Advanced Manufacturing Plan for Australia (AMP-Aus)

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WHY ADVANCED MANUFACTURING?

There are some who would argue that the current structure of Australia's economy is sound and that wealth of natural resources as well as growth in the service sector is serving the country well. Australia fared relatively well during the Global Financial Crisis avoiding recession and keeping unemployment low. However, this view ignores the reality that a number of Australia's trends are concerning – employment growth across the economy is slowing, the exchange rate movement continues to disadvantage manufacturing, global competitiveness rankings are slipping, and multifactor productivity growth is contracting. The time is now for Australia to determine what the country wants to be:

- A two speed economy with increasing regional unemployment and vulnerability to volatile commodity markets; or
- A balanced, sustainable economy that adds value to those resources through innovation and maximising natural competitive advantages.

Australia's current growth trajectory is unsustainable. Internal disparities will become exacerbated and its global competitiveness will decline because other countries are maximising their value-adding capabilities. Passivity is not a strategy for growth.

A robust advanced manufacturing base creating higher value-add products is the key element to sustainable economic growth, job creation and the development of new markets. It has the power to create jobs, value and growth to a degree that no other sector can. In fact, the US Bureau of Economic Analysis has, for example, calculated that each US$1 of manufacturing output creates a total of US$2.30 in total output in the economy. Further, every manufacturing job created has a multiplier effect in the range of 3 to 5 jobs across the rest of the economy.

Data shows that manufacturing's share of Australia's economy peaked in the 1960s at roughly 28 percent. Today, according to the Prime Minister's Task Force on Manufacturing, this sector now represents 8.6 percent of GDP and 8.3 percent of employment as the economy relies more heavily on commodity markets and the services sector. This is detrimental to the economy's overall health. Australia's economy must be diversified.

In 2010, Dow had annual sales of US$53.7 billion and employed approximately 50,000 people worldwide. The Company's more than 5,000 products are manufactured at 188 sites in 35 countries across the globe.

Strategic Priorities

It is our view that Australia has the needed input for a successful manufacturing strategy, but Australia needs a comprehensive plan based on an identified set of strategic priorities to build a diverse economy. With an eye towards the future, Australia must evaluate her comparative advantages against a backdrop of the trends driving global challenges. These strategic priorities include:

- Optimisation of the value-add of natural resources (mining and energy)
- Renewable and alternative energy sources
- Water management and associated technologies, and
- Health (medical sciences) and food (agricultural sciences)

While by no means a comprehensive list, identifying long-term strategic opportunities for Australia and aggressively pursuing them with advanced manufacturing as its base will generate sustainable growth and long-term prosperity.

WHAT IS THE ADVANCED MANUFACTURING PLAN FOR AUSTRALIA?

The Advanced Manufacturing Plan for Australia (AMP-Aus) is a plan for action – a comprehensive set of economic priorities and policy recommendations to create a stronger, more balanced economy.

- Maximising value-add from energy feedstocks
- Investing more in innovation and expand local access to capital
- Enhancing education and attracting/retaining skills and talent
- Creating genuine partnership between business & government
- Increasing access to critical global markets

The enabling environment is created by advancing a policy agenda that highlights Australia's unique advantages, prioritises inputs, combines them with intellectual capability, and not only adds value to Australia and the world's economy but provides certainty for those looking to invest. Focused on generating sustainable growth and long-term prosperity, thoughtful policy allows us to tap our human talent and to turn our ideas into innovations that can solve the world's most pressing challenges.

WHY ARE WE CREATING IT?

We can see the potency of having a strategy with the right elements. Australia has the ingredients, but no recipe. Dow is committed to sustaining – and growing – our long-standing operations in Australia, so we are taking the lead in crafting this vision for a prosperous advanced manufacturing sector. We believe the government has a big role to play, not by protectionism, but through focused public policies. Companies need to be at the table so that policies are practical, actionable and commercially viable. The AMP-Aus seeks to do just that. Dow draws on Australia's talent for our global operations, but our investment aspirations fall short because of a lack of supported advanced manufacturing strategy in Australia.

Advanced Manufacturing Plan for Australia

Policies & Recommendations to Enhance Australian Manufacturing

THE CHALLENGES FACING AUSTRALIAN MANUFACTURING

Australia has all the building blocks of a global leader including a vast quantity of natural resources, a highly skilled, talented workforce, and strong commitments to the rule of law, intellectual property protection and global trade. These encourage investment by providing a stable business climate.

However, while Australia is a world leader in terms of research, the current environment does little to address challenges associated with commercialising new concepts here and driving the creation of new markets. Australia lacks a comprehensive energy strategy, placing heavy reliance on renewables despite the Government's own analysis showing solar will only provide 3 percent of energy needs by 2050. Renewable technologies are important, but so is a balanced approach including coal, natural gas, nuclear, and prioritising energy efficiency. The de-emphasis of Science, Technology, Engineering and Mathematics (STEM) education is of concern. These challenges can be met through genuine collaboration between the public and private sectors.

Australia has been grappling with these issues. With efforts such as the Prime Minister's Task Force on Manufacturing, the Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Future Manufacturing Flagship, and other organisations focused on the question of innovation in Australia, the conversation around manufacturing is taking place. Manufacturing is a key contributor to prosperity. However, there are still mixed signals throughout the country's policy machinery. To achieve success, it needs regular reinforcement and long-term commitment.

WHAT CONSTITUTES ADVANCED MANUFACTURING POLICY?

To diversify the economic base and allow the greatest value to be realised by the Australian economy, developing a strategic view of what Australia's advantages are and how best to exploit them through a partnership between government and industry is essential. Policymakers must pursue policies on a range of issues that both directly and indirectly enable the growth of advanced manufacturing.

As well as identifying strategic priorities, we believe Australia must address five policy themes that are crucial to the future of manufacturing:

- Energy & Climate
- Innovation
- Education
- Public Private Partnership
- Trade

While there is no question that many of these challenges have a significant global component, Australia has both the ability and the opportunity to take the lead in adopting advanced manufacturing policies, creating value for its own economy while becoming an example for the world.

TRADITIONAL MANUFACTURING	ADVANCED MANUFACTURING
• Labour cost dependent • Scale dependent • In-market competitive • Input-cost critical • Tariff-protection sensitive • Low value/high volume/cyclical	• Innovation dependent • Technology cluster • Research/Manufacturing connected • Export competitive • Intellectual property critical • Genuine private/public partnership • High value/technology

NEXT STEPS

- Establish a task force to drive consensus on the Advanced Manufacturing Strategic Priorities for Australia for key industry sectors, similar to the US Advanced Manufacturing Partnership.
- Develop actionable strategies and policies to support development and growth of key industry sectors.
- Operationalise key sector strategies relative to framework of the five advanced manufacturing themes' being:
  - Energy and Climate
  - Innovation
  - Education and Skills
  - Public Private Partnership
  - Trade

Energy & Climate

INTRODUCTION

With challenges such as climate change and enhancing energy security, countries around the world are re-evaluating or initiating fresh dialogue on their energy policy. Global population will continue to grow and incomes will rise, and as such the demand for energy will increase dramatically. According to the Australian Bureau of Agricultural and Resource Economics, total energy consumption in Australia is projected to grow by nearly 35 percent by 2030. While this projection also points to a decline in energy intensity in Australia, it reflects the need for Australia to develop a comprehensive energy policy that allows for continued economic growth while also balancing environmental concerns.

Energy inputs are critical for the manufacturing process, serving as both a fuel and a feedstock. Adding value to raw energy inputs as building blocks, the manufacturing sector applies innovative technologies to produce modern materials and solutions for the world's most pressing challenges in areas like agricultural production, electronic materials, pharmaceutical breakthroughs, and wind blades and photovoltaics. Australia is endowed with a wealth of energy resources from traditional fossil fuels to high potential for vast renewable and alternative sources.

As part of our AMP-Aus, we offer our views on energy as it relates to manufacturing and the competitiveness of Australia. First, we detail the need to approach energy policy in a comprehensive manner in order to move towards a Sustainable Energy Future. Second, we present our positions and recommendations on how Australia can best use her vast energy resources to provide a higher value, diversified base for Australia's economy.

Sustainable Energy Future

We strongly believe that the future of energy is directly linked to innovative technologies, enabled through the power of chemistry, a robust plan that includes an "all of the above" strategy, using a portfolio of solutions for renewable and non-renewable energy sources. From a manufacturing perspective, we believe energy policy must include four major pillars:

1. **Conserve** by aggressively pursuing energy efficiency and conservation
2. **Optimise**, increase and diversify domestic hydrocarbon resources
3. **Accelerate** development of clean and sustainable energy alternatives
4. **Transition** to a Sustainable Energy Future

Energy for Australia

It is paramount that a comprehensive energy policy is developed so that reserves are used, from an economic and environmental perspective, in the best interests of all Australians. In the same way that global intervention is required to arrest the negative impact of climate change, how Australia uses its mix of energy resources has a strong impact on economic prosperity and the country's contribution to environmental outcomes. These decisions should not be left to market forces. A case in point is Australia's extensive gas reserves, which from a market perspective are being prioritised for export to support other countries' energy security and lower environmental outcomes. Allowing domestic natural gas resources to be harvested for liquefied natural gas (LNG) without a sufficient balance and incentive for domestic availability and distribution will be to Australia's detriment. National policy must do more to ensure the value of natural gas to manufacturers, and the Australian economy, is realised. We suggest a number of ways something can be done about this on page 9.

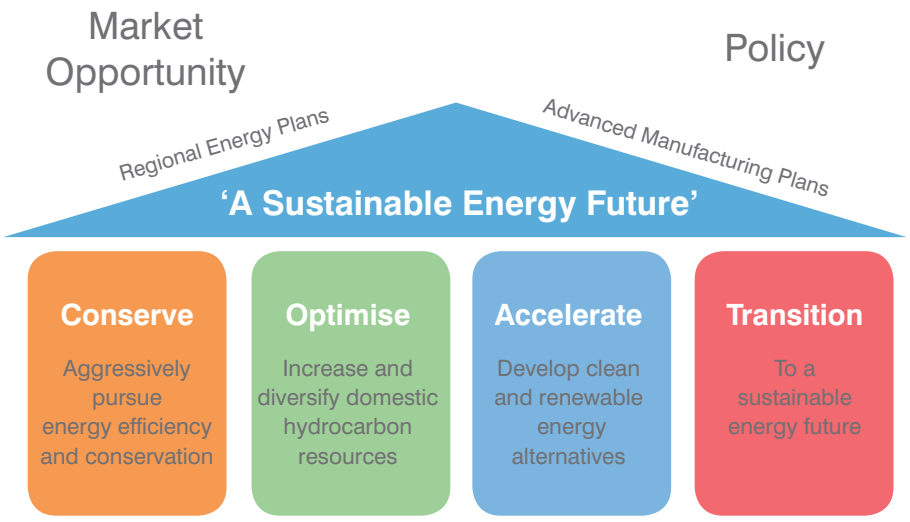
Australia will continue to be reliant on coal as a primary source of energy for decades to come. Being domestically reliant and with a huge export market, it is critical that continuing priority is placed on "cleaner" coal technologies, dewatering of brown coals, gasification and cogeneration technologies, and CO_2 capture where it can be justified.

Optimising the energy mix for Australia requires intervention to ensure that the Australian people get the best environmental outcomes for lowest possible costs. The solution will always be a portfolio of technologies using coal, gas, wind, solar and geothermal. However, exporting a low carbon emitting resource, as is the case with natural gas, and then investing much more in expensive renewable or clean coal technologies to get the required environmental outcomes will be to Australia's detriment. An energy policy that addresses these considerations is essential for the long-term economic health of the country as well as its contribution to the global environmental outcomes.

Sustainable Energy Future

OVERVIEW

While global demand for energy continues to accelerate, continued security and prosperity for the human family means developing, investing and optimising the full spectrum of energy options—from efficiency and conservation, solar and other renewables, nuclear and clean coal to additional oil and gas production, which are the building blocks that will lead us to a next-generation low-carbon economy.



***Conserve** by Aggressively Pursuing Energy Efficiency and Conservation*

As the Prime Minister's Task Force on Energy Efficiency put it in 2010, "Energy efficiency is Australia's untapped energy resource – a means to improve the productivity of the economy as well as an important element in moving towards a low-carbon economy." Often referred to as the low hanging fruit of energy policy, it also has the benefit of being one of the most sustainable energy options. According to analysis by the Australian Alliance to Save Energy, if Australia could reduce its energy intensity to a level equal to other leading OECD countries, the country would use 40 percent less energy.

Manufacturing is an energy-intensive sector of the economy, and there are real opportunities for manufacturing processes to become more efficient. Efficiency in manufacturing is not only the environmentally smart thing to do – it's economically smart. Implementing cost-efficient energy efficiency measures has the potential to save Australia more than A$5 billion per year. More efficient processes use less fuel, and therefore save companies money.

The Australian government can encourage companies to make these investments, through national goals and incentives for efficiency investments. The Prime Minister's Task Force recommended a 30 percent improvement in energy intensity by 2020. The unfortunate experience of the home insulation program must be put behind the government and policy introduced to support and encourage wide-spread deployment of energy efficiency measures and technologies across all sectors, including manufacturing. This is not to say that there are not some effective programs in place today. However as this efficiency and conservation approach yields the most substantial returns for capital employed it should be treated as the highest priority in the development of energy policy.

***Optimise**, Increase and Diversify Domestic Hydrocarbon Resources*

Economic growth will continue to be enabled by fossil fuels for the foreseeable future and optimising the use of domestic sources is critical for ensuring long-term, sustained vitality. Australia is blessed with a wealth of energy resources including coal, uranium and large reserves of gas. The opportunities these resources offer the country are tremendous as long as a strategy for long-term, diversified economic growth exists. Hydrocarbons must be leveraged for their greatest intrinsic value as a raw material or feedstock for products and solutions for the world's toughest challenges.

However, Australia has a habit of exploiting her reserves for export to fuel other countries' growth. In fact, since 1989 Australia's energy exports have grown an average of 11 percent per year, now representing nearly two-thirds of all energy resources produced. As we discuss in greater detail in the following section with regard to natural gas, this provides an immediate one-time benefit to the economy while ignoring the value-add, long-term potential of these resources if prioritised for domestic manufacturing purposes. Relying on the export of resources during a boom time creates the perception of sustainable growth. However, without a diversified economy which includes a vibrant advanced manufacturing sector, Australia is at the mercy of the world energy markets.

Australia's vast coal reserves put the country in a leadership position with regard to the future of coal as an energy source in a carbon constrained future. Research efforts in Australia already have this as a focus with the initiation of Carbon Capture and Storage Institute (CCSI) and a number of CCS projects underway. Higher efficiency coal-fired power and carbon capture are an essential part of the world's energy mix going forward, and it is evident that Australia should be a leader in implementation.

A forward thinking, long-term energy policy is necessary for ensuring a balanced, diversified use of the nation's hydrocarbon resources. The strategic use of Australia's natural resources is a key consideration which can sit harmoniously with a competitive free trade environment.

***Accelerate** Development of Clean and Renewable Energy Alternatives*

Renewable energy options in the form of wind, geothermal and solar are an essential part of the energy mix going forward and Australia has an abundance of all three. The key is to drive investment and innovation into those areas to help drive costs down. Australia's Renewable Energy Target (RET) of 20 percent by 2020 is a key part in helping to drive that investment and innovation. However, with renewables currently only representing 2 percent of energy production and 5 percent of consumption, there is a lot of work to be done.

China, South Korea and other Asia-Pacific countries have committed substantial investments to alternative energy sources, including nuclear, hydroelectric, wind and solar power — establishing the region as a test bed for the newest power generation and transmission technologies. The chemical industry is a key component of that innovation. To advance the development of alternative energy sources, governments and companies need to work together to promote commercially-scalable industries. While incentives are necessary for early adoption to minimise the risk of early movers of innovative technologies, we need to ensure these technologies are economically viable in normal market conditions. Australia's policy should focus on the innovation side of the renewable equation in order to bend the cost curve down and pull the market forward.

Globally Dow uses the equivalent of 850,000 barrels of oil every day. This is the equivalent of the oil consumption of all of Australia. Recognising the significant opportunity for cost savings and to reduce our carbon footprint, we have taken actions to reduce our energy intensity by 38 percent. The initial investment to reach this level was US$1 billion, yet close to US$10 billion in savings has been delivered to the company's bottom line.

The bulk of the manufacturing of components, be they photovoltaic panels or wind turbine elements, is done offshore translating to an addition to the trade deficit in order to install increased capacity. While a focus on increasing renewable consumption through the RET is notable as part of a balanced energy approach, Australia must also not lose sight of the manufacturing potential clean energy sources offer. However, in order to efficiently drive costs down for renewable and alternative energy and best achieve renewable targets, policy targets must be technology and fuel-source neutral.

***Transition** to a Sustainable Energy Future*

Taken together, the first three pillars will help ensure the transition to a sustainable energy future that includes a combination of efforts to slow, stop and reverse the growth of greenhouse gas (GHG) emissions. If government policy is going to foster this transition, it must make possible the shift to an advanced manufacturing economy that produces and employs a spectrum of clean, low-GHG technologies designed to keep energy prices stable and affordable.

As Australia continues to explore and adopt policies to reduce GHG emissions, pricing carbon may be a necessary step to offer business some degree of predictability. However, in the absence of a global commitment to reduce emissions and develop market-based approaches to achieve this end, Australia must be mindful of the challenges presented in leading the development of an Australia-only system. Carbon pricing in isolation puts the country on its own raising prices on energy-intensive industries such that it creates a disincentive for investment. Carbon policy of today may, in fact, be less about the specific price on carbon and more about the "all of the above" strategy detailed in the first three pillars.

RECOMMENDATIONS

We strongly advocate that government and private sector work together to promote comprehensive and sustainable energy policies. The recommendations below are a critical step in this partnership:

- Identify and enact national targets for improved energy efficiency across all sectors.
- Promote the use of financial incentives and low-interest loans to assist manufacturers of all sizes in implementing energy efficiency measures.
- Balance and prioritise incentives for energy investments to ensure an appropriate mix of exploration and utilisation of resources that recognises and promotes the value add of hydrocarbon feedstocks.
- Develop long-term plans for research into alternative and renewable energy technologies where Australia can take a global leadership role. Implement support for this research and for the development of manufacturing technologies that deliver value to Australia.
- Regularly review impacts of the Australia-only approach to carbon pricing in order to protect against a disincentive for energy-intensive industries to invest in country.

WHAT DOW IS DOING

- Dow's innovations are leading to more energy efficient products, cost effective energy alternatives and less carbon-intensive raw materials and manufacturing processes. These solutions include solar shingles for builders and homeowners, higher efficiency building and appliance insulation materials, energy storage technology and innovations to put carbon to work.
- Since 1990 Dow has saved nearly 5,500 PJ – enough to meet every home in Australia's energy needs for almost 12 years.
- Dow works directly with the oil & gas producers to help develop solutions to increase supply and purity of supply in the most safe and efficient manner possible.
- Dow has invested more than US$100 million to develop and manufacture the DOW POWERHOUSE™ Solar Shingle, a building integrated photovoltaic (BIPV) solution that could revolutionise the way we power homes and buildings.

- Dow formed Dow Kokam, a joint venture between Dow and TK Advanced Battery, LLC, to produce lithium-ion battery packs for hybrid and electric vehicles at its battery manufacturing facility in Midland, Michigan.
- The company is actively managing its GHG footprint through aggressive 2015 goals targeted at energy efficiency and climate change mitigation and enhanced research programs.
- At its Altona site, Dow has reduced 10,000 metric tons of CO_2 per annum from 1999 - 2010, the equivalent of taking 900 cars off the road.

Optimising Energy for Australia

OVERVIEW

Many countries globally have recognised the local benefits realised by using energy resources in value-added downstream manufacturing. For example, the American Chemistry Council recently showed that in the US, a 25 percent increase in ethane supply, derived from natural gas production, would generate 17,000 direct, high paying jobs, US$4.4 billion/yr in federal, state and local tax revenue, US$33 billion increase in US chemical production, and US$132 billion in US economic output. Australia cannot afford to ignore these benefits.

Australia has significant energy resources including large reserves of gas. In fact, over the past two decades, Australia has identified an increase of three times the gas reserves, with the vast majority of these located in Western Australia. To a large extent the exploitation of these reserves has been for export and, to a lesser extent, power generation and energy intensive industry. The more recent development in extraction of shale gas also holds promise for Australia so it seems apparent that the challenge in coming years is effective and competitive use of these resources in the context of limiting carbon emissions and creating the greatest value for the country.

According to the Australian Department of Resources, Energy and Tourism, energy exports represent roughly two-thirds of all energy production in Australia. Of this, liquefied natural gas (LNG) plays a significant role with approximately 50 percent of all natural gas produced in Australia being exported as LNG. This ranks Australia the 6th in the world for LNG exports. Further, Western Australia, where the majority of the new reserves have been identified, produces the bulk of supply as part of LNG projects.

Currently more than A$140 billion in LNG projects are underway in Australia. This aligns with the government's stated desire to directly compete with Qatar for the role of the world's leading LNG exporter. However, even Qatar recognises that it must diversify its economy with an eye towards manufacturing and recently announced significant investment in the petrochemical sector.

To be sure, the LNG industry has brought many benefits to Australia in terms of export credits. However, prioritising this one-time contribution of gas to the economy while ignoring the value-adding potential of natural gas for downstream manufacturing is short-sighted.

Allowing domestic natural gas resources to be harvested for LNG without a sufficient balance and incentive for domestic availability and distribution will be to Australia's detriment. Australia is fueling the growth of other economies and buying back the higher value-add products, adding to the trade deficit. In order to ensure a sustainable, advanced manufacturing economy where the products the world needs are made here and exported globally, Australia must take a more strategic view on how to prioritise her energy resources. The proper policy environment could provide a prosperous future for the LNG industry, domestic manufacturing and the Australian community as a whole, optimising the use of this resource.

WHAT MORE IS NEEDED

When considering the use of the country's natural resources, it is important to consider the impact of domestic needs and availability of the resource for domestic industry. A key part of the equation is the value returned to the state and the community when the resource is used for downstream value-added activities. Natural gas, be it as a fuel or feedstock for downstream processing, is an essential component in the development of advanced manufacturing industries. When used as a chemical feedstock, natural gas creates additional value as much as eight times the value of the gas itself. This far exceeds the value generated by selling the gas as LNG.

National policy must do more to ensure the value of natural gas to manufacturers, and the Australian economy, is realised. An example is the Western Australia government's domestic gas reservation policy. The equivalent of 15 percent of LNG production is

required to be set aside for domestic purposes in order for LNG producers to have access to the land where the processing facilities are located. While this is a fairly blunt instrument, this model supports industrial development and creates a balance between energy exports and domestic development. Other mechanisms must be employed to achieve the same results.

The federal government also has a role to play in ensuring proven natural gas reserves are developed and the gas brought to market. Where a case can be made for domestic gas development of an offshore field the proponent should be able to access that gas unless that there is a plan to commercialise already underway in the short term. Policy to incentivise production, rather than "parking", of reserves is necessary. Australia has been active in promoting the "use it or lose it" approach to lease retention, but we believe that lease holders should be required to consider, evaluate alternative development proposals if they provide a path to utilise the reserve on a shorter time frame than their own proposals. In this way, domestic gas and value adding manufacturing development have the opportunity to proceed thereby balancing the interests of the energy exporter with domestic consumer and manufacturer.

Due to the size of the country and the remoteness of many of these reserves, there have been, and still are, significant hurdles to most effectively use the resources to generate the optimum value for the country. It is necessary to have the ability to deliver the gas to the consumer efficiently which will require appropriate pipeline infrastructure. Australia's pipeline network is limited and a large percentage of reserves are isolated from the domestic consumer. Australia must develop priority pipeline connections to deliver gas to key centres and producing locations. Additionally, the government should seek to facilitate pipeline investment so that a competitive market can develop and that in turn it can promote investment and jobs for Australians. In part, this requires the government to nominate locations of strategic development and facilitate the availability of gas to them.

RECOMMENDATIONS

It is essential for Australia to develop the right policy that will allow the value adding benefits of downstream investment to be realised for all Australians. Jobs, increased investment, energy security, increase in government revenues and higher economic activity well in excess of the return from LNG, all flow from this value-added approach.

- Provide an exemption from the Petroleum Resource Rent Tax for domestic uses in order to incentivise producers to sell natural gas domestically.
- Ensure that the "Use it or lose it" approach can be implemented to avoid parking of reserves for LNG projects particularly in strategic locations. Lease holders should be required to consider and evaluate alternative development proposals if they provide a

path to utilise the reserves on a shorter time frame than their own proposals. This will reinforce the importance of gas supply to strategic manufacturing locations and deliver downstream multiplier benefits to the Australian economy .

- Promote downstream manufacturing by applying a royalty on calorific content or natural gas liquids export based on the loss of flow on benefits.
- Develop a pipeline strategy to ensure a competitive market for gas and to support growth in domestic manufacturing. This includes the identification of strategic locations for development as well as additional easements from the government for pipeline development.

WHAT DOW IS DOING

- We use ethane – a minor component of natural gas – as feedstock for the production of a multitude of chemicals and plastics. This includes products that go into the development of renewable energy technologies like the Dow POWERHOUSE™ solar shingle. In the process, the company creates a "chain reaction," stimulating local investment, creating high paying jobs, attracting top scientists and engineers and strengthening the industrial and economic base of the U.S.
- Dow has projects to use coal and methane as feedstocks for chemicals and plastics.
- As an energy solutions provider, Dow offers innovative chemistry and technologies for improved shale stabilisation and well bore stability. In addition, Dow Biocides offers a wide range of products that will help meet the many different treatment conditions of water for oil and gas stimulation and in the antimicrobial protection of end-use oil, gas, and their derivatives.
- Dow recently announced plans to increase the company's ethylene and propylene production through investment in the U.S. Gulf Coast Region and to integrate our U.S. operations into feedstock opportunities available from increasing supplies of U.S. shale gas and natural gas liquids. These investments are expected to create new jobs (e.g., construction jobs) in the near term and additional manufacturing jobs at these locations over the longer term while also increasing exports.

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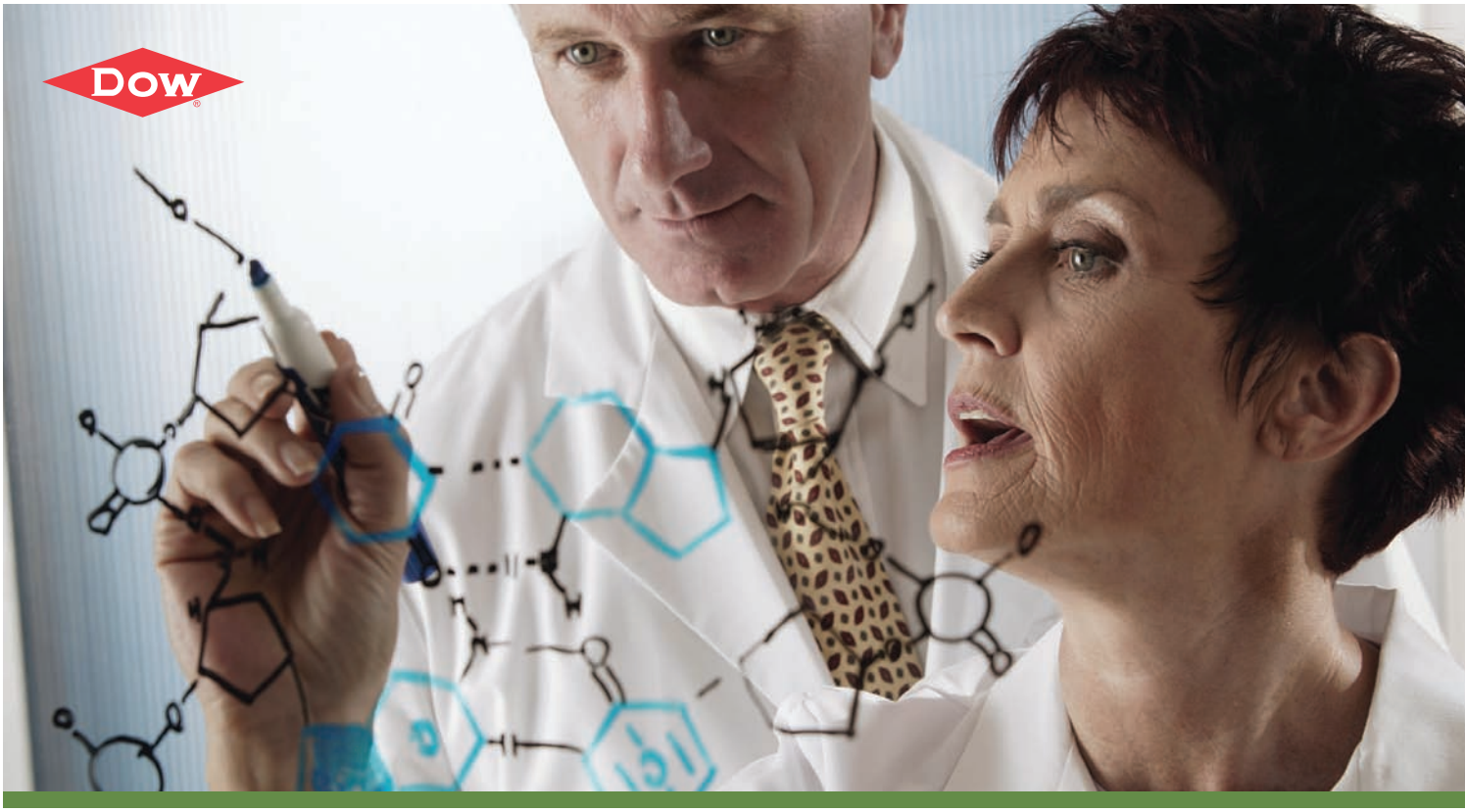


Innovation

INTRODUCTION

Various industry, business and government organisations in Australia have recognised that innovation is essential to a sustainable manufacturing sector and corollary to a robust advanced manufacturing base creating higher value-add products. Centres of innovation can become hubs of commerce, attracting the best and the brightest talents, business investment, and manufacturers who know how to commercialise products coming down the pipeline. This creates a virtuous cycle of economic activity, a supply chain of sustainable jobs, and a wealth of high value-add products for both domestic and global marketplace. In some cases, this will create entire new markets and industries further diversifying and building resilience into an economy.

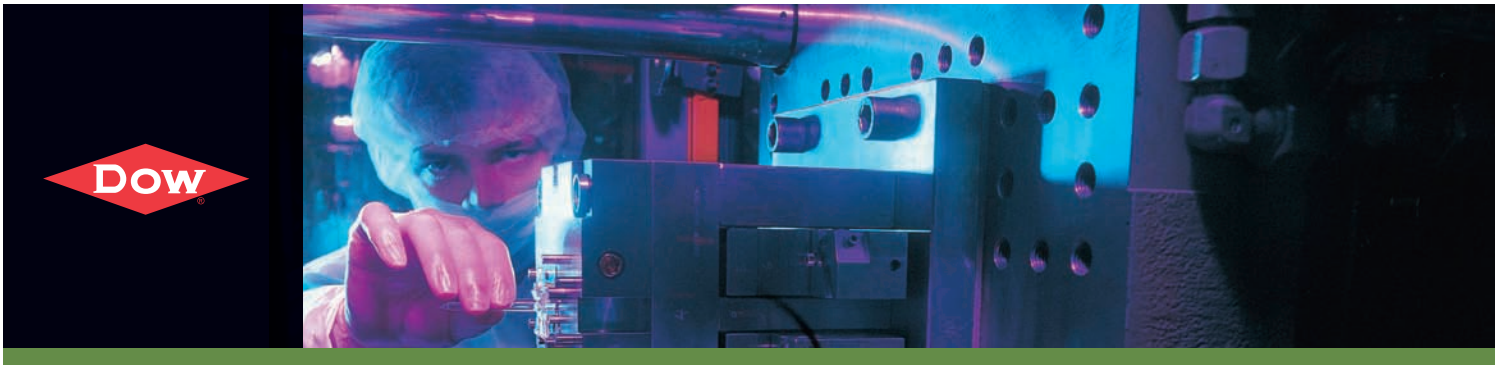
Australia has the intellectual capital to deliver on these innovations. The Commonwealth Scientific & Industrial Research Organisation (CSIRO), the Collaborative Research Centres, the many leading universities and other tertiary educational institutions are examples of world class organisations. In fact, Dow sources technology know-how and collaborates with institutes such as the Australian Institute of Bioengineering and Nanotechnology (AIBN) and the Victorian AgriBiosciences Centre (VABC) on some of our cutting edge ideas.

For innovation to generate economic benefits, it needs an enabling environment that encourages both core nascent and application-focused research and development (R&D), collaborations within and between public and private sectors, and turning of ideas into products and solutions that the market wants.

Australia has made concrete moves to cover elements of this enabling environment such as its recent pledge to inject a notable US$102million into its Innovation Investment Fund (IIF). Such positive moves are addressing weak areas in the innovation environment – specifically in venture capital availability. However, with global distances reduced today by infrastructure and trade connectivity, it is not about the environment in Australia getting less conducive for investments in innovation, but about other countries making it easier for

businesses to invest, innovate and grow, thereby diminishing the country's comparative and competitive advantages.

There is today an increased level of interest in advanced manufacturing and the role of innovation in the Australian landscape. Activities are generally aligned in intent. From a public policy perspective, there is an opportunity to provide leadership and guidance in terms of identifying Australia's strengths, building a manufacturing and innovation eco-system around these, and focusing time and resources to help Australia *win* on the global stage.



Research and Development (R&D)

OVERVIEW

Dow leverages our immense R&D pipeline to create a unique, science-based and customer-driven R&D powerhouse. We invest over US$1.7billion in R&D annually in key sectors across the four megatrends of consumerism, health & nutrition, energy and transportation and infrastructure.

While Australia's gross expenditure on R&D (GERD) has grown since 2000 to a record 1.97 percent of GDP in 2006, GERD at about 2.21 percent as a proportion of GDP in 2009 is still below the OECD average of 2.33 percent. This places Australia 12th out of 31 OECD countries. In the last decade, Australia has fallen from fifth to 20th in the World Economic Forum's Global Competitiveness Index. According to the Government's own report, Powering Ideas: An Innovation Agenda for the 21st Century, part of the reason behind this fall is that spending on science and innovation has fallen close to 25 percent since the early 1990s and GERD lags behind many OECD countries.

While Australia is way ahead of other countries in terms of number and quality of academic publications – 2x the level of other OECD countries on a per capita basis - the general sentiment is that potential economic outcomes of these R&D efforts, measure of which include level private-public sector collaborations on research and number of triadic patenting, remain very low.

While manufacturing does represent roughly 40 percent of all private R&D spend in Australia, data from the Australian Bureau of Statistics also showed that in 2009-2010, business expenditure on R&D (BERD) by small and medium enterprises (SMEs) comprises just 19 percent of BERD despite SMEs representing the majority of the manufacturing sector in Australia.

Recognising the importance of a strong focus on innovation and R&D, in 2009 the Australian Government adopted a set of seven National Innovation Priorities focused on building stronger collaboration between public researchers and industry, incentivising business innovation and building and commercialising new markets and industries.

In September 2011, the Department of Innovation, Industry, Science and Research (DIISR) published the 2011 Strategic Roadmap for Australian Research Infrastructure that articulated a national research infrastructure and priority areas to further advance "Australia's research capacity and improve innovation and research outcomes over the next five to 10 years."

Together, they highlighted what Australia is doing to build research capabilities and ensure the right factors are in place for research to flourish.

In addition, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) has played an important role through its 10 National Research Flagships, focusing on areas such as Climate Change, Energy, Food and Future Manufacturing. These offer an important foundation.

WHAT MORE IS NEEDED

The Australian Academy of Technological Sciences and Engineering (ATSE) conducted a workshop in August 2011 in Brisbane which resulted in many excellent recommendations that would go towards generating economic benefits from innovation, or "innovation dividend" as it was termed.

In addition to these recommendations, Australia needs to increase its GERD to match or surpass OECD average levels in order to keep pace with competitor countries. Availability

of funds to support research leading to proof of concept stage will remove barriers for the private sector, especially smaller enterprises, to participate at a greater level if they are not deterred by upfront investment s of human resources and money. At the same time, governments should look at providing incentives, not subsidies, to enterprises to engage in R&D activities.

RECOMMENDATIONS

- Focus R&D funding by clustering investments around strategic priorities leveraging Australian advantages such as natural and intellectual resources
- Incentivise R&D through restoring tax benefits and direct grants at a level competitive with the OECD top quartile
- Redirect funding to later stage innovation, in particular near-demonstration projects
- Reward measures of the "innovation dividend" such as collaborations with private sector and triadic patenting in addition to R&D
- Establish clear frameworks for increased and coordinated industry collaboration and consortiums
- Given the local level of R&D spending of SMEs and their dominance of the private sector, SMEs should be supported to leverage R&D capabilities in the country

Commercialisation

OVERVIEW

Australia is highly effective at producing research at roughly twice the level of other OECD countries on a per capita basis. However, when it comes to triadic patents, Australia ranks in the lowest third of the OECD average. This is but one sign of the difficulties Australia has in taking feeding concepts through the innovation pipeline to the point of commercialisation. While innovation is a critical to an advanced manufacturing economy, it has to be recognised that only focusing on the research aspect is not innovation. Until a concept is demonstrated and scaled up, value has not been realised. Limited access to capital and regulatory barriers for entrepreneurs are two key areas limiting later-stage innovation in Australia.

Access to Capital

It is a well accepted notion in Australia that one of the main barriers to the commercialisation of new concepts is a significant lack of access to capital. Venture capital (VC) is an important vehicle for financing new and innovative high-risk ventures. Risks present opportunities for venture capitalists to place bets and to contribute to the flourishing of ideas with good potential to pull through to the next stage and deliver "innovation dividend".

As a percentage of GDP, Australia VC investment is at or just below the median of OECD countries and well below the United States, Israel, and leading European countries which represent the vast majority of global VC activity. Australian VC fundraisings declined for the fourth consecutive year, reaching the lowest number of fundraising commitments in the young history of the Australian VC industry. Although a reflection of trends in other countries, Australia has slipped from ninth place in 2005 to 17th place in 2011 in terms of venture capital intensity. One of the reasons might be a lack of the type of high-tech industry clusters, such as the Silicon Valley configuration of a geographic concentration of enterprises, that would foster VC investment activities. This only reinforces the need to focus innovation pipeline around strategic priorities.

Other than the lack of VC funds stunting the development of innovation and new ventures in Australia, it has also appeared to result in a fleeing of companies to other countries where there is greater access to funds. Latest data from The Australian Private Equity & Venture Capital Association Limited (AVCAL) also shows that around 30 percent of current and past portfolio companies are Australian-grown companies now domiciled in the USA.

Business Regulatory Environment

Start-up companies and SMEs are an important element in the commercialisation equation. Without those willing to take a risk on a new technology or product, a vibrant advanced manufacturing sector will be even more challenged. In addition to the difficulties accessing venture capital, businesses must navigate a highly complex set of regulations. As the Australian Industry Group (AiG) states in their submission to the Future Council of Australian Governments (COAG) Regulatory Reform Agenda, "business regulation is acting as a barrier to innovation and growth within the manufacturing sector and across manufacturers of all sizes – including regulations acting as a barrier to employing more staff… introducing new product lines, processes or services and changing work practices."

WHAT MORE IS NEEDED

If Australia wants to retain innovative ideas from its human capital, it needs to learn from the best of other countries that it has fallen behind in from a VC environment perspective. While the government has provided a substantial amount of funding for new ventures, it is hovering at or below the OECD median level. The government needs to also explore how it can provide incentives for other sources of funding to participate in the VC market, so it can drive the local connection between innovation and advanced manufacturing.

The government must address the inefficiencies and disincentives an overly complicated regulatory regime creates. Reducing the burden on start-ups and SMEs by streamlining the regulatory process is a key way to attract more business participation in the commercialisation of new technologies.

RECOMMENDATIONS

- Provide attractive tax incentives for venture capitalists to invest in Australian innovations
- Explore alternative sources of fund participation in VC market and create an operating environment that would stimulate VC activity
- Create platforms for VC and promising research and technologies to find each other. In particular, focus on SMEs who may not have the necessary resources and awareness of how to get started
- Forge stronger collaborations between researchers and industry, particularly those with the absorptive capacity to scale innovative concepts, to help bridge the so-called "valley of death"
- Streamline business regulations to eliminate unnecessary bureaucracy and overhead for start-ups and SMEs

Education and Skills

OVERVIEW

As the Economist wrote in May of 2011, "If Australia is going to compete in anything other than iron ore, it will need a highly educated workforce." The Australian workforce is relatively small, and is ageing. To build an economy run by the best and the brightest, we need an education system that can produce them, which also includes continued development of skills to ensure the workforce is well prepared for technology change. Global businesses invest where the talent exists, and Australia must do all that it can to make sure the talent is cultivated here.

The extent and quality of education in Science, Technology, Engineering and Mathematics (STEM) at the primary, secondary and tertiary levels is a matter of concern. The situation is aggravated by shortages in the pool of interested students, shortages of qualified STEM teachers, and an ageing workforce. The national science curriculum is regarded by many as somewhat lacking. Additionally, while the universities in Australia are regarded for their capabilities in science and engineering education, fewer students are entering university interested in pursuing this career path. Prioritising STEM education will help build the foundation for an advanced manufacturing economy with improved innovation, job growth and competitiveness at its core.

The Grattan Institute finds that Australia's economy is at risk of critical deterioration when the resources boom ends if the decline in productivity is not reversed. A key element of the reversal, they argue, is improvements in education and training. Lack of a highly skilled workforce is identified as a problem for both the ability of the manufacturing sector to fill positions as well as increase productivity. In addition to the lagging STEM education system in primary and secondary levels, this also includes continued training of employees for implementing technology changes and retraining of those currently outside the labour market to build a base of relevant skills. According to Manufacturing Skills Australia,

shortage of skills is a main factor in firms' troubles in improving their productivity and impacts approximately one-third of Australian companies. In fact, Australia's productivity growth was just 0.3 percent over the past year, which is the second slowest since 2004-2005 when it actually contracted.

Finally, addressing immigration challenges related to students is imperative. The report *Education at a Glance 2010: OECD Indicators* shows that over the last 30 years, the number of students in tertiary education at schools outside their country of citizenship has grown globally from 800,000 to 3.3 million. The Australian student visa system must come to terms with this growth and create an environment that encourages those educated here to remain here.

The policy environment must do more to accelerate and fund programs that focus on STEM education while increasing partnerships between industry and academia to promote careers in advanced manufacturing and ensure a more skilled workforce.

WHAT MORE IS NEEDED

The Australian Academy of Technological Sciences and Engineering's (ATSE) Science and Technology Education Leveraging Relevance (STELR) program strives to help Australian children fall in love with science. The STELR Program is a hands-on, inquiry-based, in-curriculum program designed for Year 9 and Year 10 students to provide them with both theoretical scientific education and practical applications of science. Teachers involved in the program report seeing an increase in the level of students' engagement with the material and more opportunities connect material with real world applications. STELR is an important model for new classroom innovations.

Improvements in STEM education and an environment that entices students to pursue STEM careers are imperative for establishing a sustainable advanced manufacturing economy. The responsibility for creating this environment does not fall on any one single sector. Government, academia and industry need to intensify cooperation in programs to encourage the highest quality STEM education at all levels to fill the talent pipeline, and develop ways in which to improve retention of students interested in STEM careers.

The undersupply of students pursuing STEM-related careers is well documented in Australia. A report by the Australian Department of Education, Science and Training found that there could be a 35 percent shortfall of professionals in science-related fields relative to demand. While this is not a struggle that is confined to Australia, it has to serve as a wakeup call as STEM skills are what underpin innovation capabilities which fuel economic growth.

Government attention is needed regarding the qualifications of teachers in teaching STEM subjects. A study by the state of Queensland found that 30 percent of upper-level math teachers lacked subject-specific qualifications. This points to a tremendous need for teacher professional development opportunities including in areas such as project-based learning and hands-on models. Australian Department of Education findings support the idea that while STEM subject matter is of interest to most students, the current teaching methods are a deterrent to many. Enhancing the quality of teachers in STEM fields and offering enhanced trainings in new, innovative models for promoting STEM is critical for building talent.

In order to ensure an adequate supply of labour to grow the manufacturing sector, policy must also place an emphasis on workforce training and retraining. The manufacturing sector in Australia lags behind other industries in the proportion of workers that have completed non-school qualifications. According to the Australian Bureau of Statistics, 45 percent of those employed in manufacturing hold no non-school qualification – close to 10 percent higher than the average for all industries. Providing greater access to and incentives for workforce training will aid in ensuring a continued pipeline of talent for manufacturing.

Finally, Australia needs to do more to ensure that international students educated here, particularly in STEM related fields, stay here in order to drive our economy rather than return home to compete against us. Universities Australia recognises this in their Submission to the Knight Review from 2011 when they argue international students need more opportunity to undertake work in in-demand disciplines in Australia which would build on the quality of educated and skilled human capital available to Australian companies.

RECOMMENDATIONS

- Establish a policy framework for recruiting and continued training of teachers in STEM related disciplines.
- Develop public programs aimed at encouraging students to pursue careers in science and engineering.
- Create incentives and tax credits for companies who encourage continued training and education of employees.
- Develop curricula to encourage the participation of high school leavers in engineering education and training
- Consider mentoring programs for new STEM educators as valuable tools to further develop teaching skills in challenging technical subjects.
- Foster a strong link between school students and STEM professionals via mentoring or internships to further students' understanding of 21st century STEM careers
- Provide a 3-year automatic visa extension for international students who receive PhD's or equivalent in STEM-related disciplines.

WHAT DOW IS DOING

- Dow has a longstanding commitment to STEM education, which has been a key area of focus of Dow's charitable contributions connected to the Contributing to Community Success 2015 Sustainability Goal. Through partnerships with key universities and technical schools, Dow works to emphasise those skills which are vital to our continuing efforts across all specialisations.
- Dow is a partner of the University of Sydney's Major Industrial Project Placement Scheme (MIPPS) through the School of Chemical and Biomolecular Engineering which offers scholarships and full-time work experience through high-level investigative projects under a mix of industrial and academic direction.
- Dow is a supporter of the Science, Technology, Engineering and Mathematics Network (STEMNET) which endeavours not only to promote science and technology within the Wyndham and Hobson's Bay community but provide students with opportunities to excel in their educational learning.
- To increase public appreciation for chemistry, encourage students to pursue careers in science and generate enthusiasm for the creative future of chemistry to solve world challenges, Dow was a Global Partner for the United Nations International Year of Chemistry in 2011. Dow led in this international collaboration to engage more than 200 partners in all aspects of chemistry through events, educational lectures, exhibits, and experiments across more than 40 countries.
- Dow is the sole sponsor of the 2012 International Chemistry Olympiad, an event offering chemistry students the opportunity to compete and network with people from around the globe. More than 70 countries are expected to send teams of students.
- Dow is one of the sponsors of the American Australian Association's individual Fellowships for advanced study in the United States. The scholarship is open to Australian citizens and permanent residents.

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Trade

INTRODUCTION

Advanced manufacturing relies on global markets. Driving investment and exports, the ability to tap into global supply chains and sell products to consumers around the world helps companies of all sizes from all locations exploit competitive advantages across regions. Additionally, by providing a common of rules, liberalised trade removes unnecessary complexity and barriers from the trade of goods.

Australia deserves credit for its progressive stance on trade. Following the phased removal of protectionist trade policies starting in the 1980s, Australia has taken an active role in pursuing trade liberalisation on both a bilateral and multilateral basis. With its close proximity to some of the fastest grown markets and emerging economies in the world, Australia should accelerate this focus to improve the business climate and to create a stronger, more balanced economy.

Australia should continue to balance an open, progressive external trade policy with fair and efficient domestic practices. For example, there are issues surrounding Australia's anti-dumping policies and enforcement. Though it is clear competing Australian industries require a viable anti-dumping system to counter predatory or excessively aggressive behaviour from some exporters, the mechanisms inherent in the current anti-dumping system are in need of revision.

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Bilateral Trade Agreements

OVERVIEW

When it comes to global markets, Australia has an advantage of geography. Located in the same region as some of the worlds fasting growing emerging economies like China, India, and ASEAN, access to these consumers and potential business partners is good for Australian manufacturing. By establishing a level playing field, trade agreements facilitate this access by ensuring parties are committed to rules-based market liberalisation and have established mechanisms for dispute resolution. According to a Centre for International Economics report, trade liberalisation over the last two decades helped add between 2.5 and 3.5 percent to Australia's GDP.

Australia's current trade policy has five fundamental characteristics guiding the pursuit of bilateral free trade agreements targeted at major trading partners. These key characteristics include:

- *Unilateralism:* Leveraging Australia's economic strengths to demonstrate the commercial growth value of pro-competitive reforms
- *Non-discrimination:* Pursuing open agreements without exception instead of establishing exclusive or distorting preferential access
- *Economics:* Focusing trade on economic value, not using it as a foreign policy tool
- *Transparency:* Open negotiations and public promotion of the benefits of the agreement so companies and the public alike understand – and take advantage of - the benefits
- *Trade policy and economic reform:* Fundamental linkages to demonstarte that trade can help all countries continue to grow by promoting open, liberalised markets.

JAPAN
INDONESIA
MALAYSIA

For Australia, key challenges in trade are to maximise geographic locations to secure preferential trade agreements with the fastest growing economies in Asia. Among others, the country is currently pursuing the following FTAs:

- **Australia – China Free Trade Agreement:** (negotiating since 2005): A key trading partner for Australia due to both location and it's market of 1.3 billion people, further developing this relationship in a way that creates shared value for Australia must remain a priority. Though there have been pauses in the negotiations, there is new momentum to promote a comprehensive agreement that would include sensitive areas of agriculture, services and temporary movement of people. Bilateral trade between Australia and China is valued at AU $105 billion.
- **Australia – India Comprehensive Economic Cooperation Agreement:** (negotiating since 2011): A market of 1.2 billion people, India's economic growth is expected to continue at a rapid pace. The most recent negotiations and more targeted as a comprehensive economic partnership agreement will cover investment and trade in goods and services. Bilateral trade between Australia and India is valued at AU $22 billion.
- **Australia – Korea Free Trade Agreement** (negotiating since 2009): An FTA with South Korea presents a significant opportunity to grow what is already one of Australia's largest export markets. It would be a comprehensive agreement covering the full range of products/services. Bilateral trade is valued at AU $30 billion.

RECOMMENDATIONS

- Accelerate and conclude negotiations with China, India and South Korea
- Aggressively pursue negotiations with the Gulf Cooperation Council (GCC)
- Focus trade agreements on future markets and exporting high-value products, not just resources and agricultural products.
- Identify and promote new trade agreement negotiations with commercially significant economies, particularly focusing on the Asia-Pacific region.

Regional/Multilateral Trade Agreements

TRANSPACIFIC PARTNERSHIP

Australia is also a key partner to the US and other economies in the negotiation of the TransPacific Partnership (TPP). To the government's credit, Australia has stated the TPP is the highest regional trade negotiation priority recognising that the TPP represents more to the country than just free trade with key economies, but also the opportunity to set the standard for future growth across the broader region. The TPP has the potential to be a model for "next generation" trade in Asia and to be the basis for an eventual free trade area of Asia-Pacific.

The TPP is a significant opportunity for advanced manufacturing as an opportunity to establish a high-standard, high quality agreement across a core of Asia-Pacific Economic Cooperation (APEC) countries, and eventually to enable APEC to reach the long-standing goal of a region-wide Free Trade Agreement. The TPP would also work constructively to create high standard commitment in Australia's ongoing bilateral negotiations with Malaysia and Japan as they engage in the TPP negotiations.

For manufacturing, key elements of TPP include:

Tariff Reduction

The efforts of TPP partners to commit to significant reductions in tariffs on chemicals and a wide range of manufacturing products is notable. Eliminating tariffs on chemicals, a necessary input for all downstream manufacturing, is a key enabler to promote manufacturing growth.

Regulatory Coherence

The TPP includes ground-breaking efforts on regulatory reform, built on the importance of stakeholder input, the use of sound science, quality data, economic and cost-benefit analysis, and the consideration of the impact proposed regulations have on trade and investment. To fully benefit, the TPP must incorporate strong commitments by all current and potential partners that will lead to transparent and predictable regulatory and rulemaking procedures across all sectors. Specifically, the agreement should develop and promote incorporation of regulatory coherence principles which should guarantee the independence and impartiality of regulators and ensure all market participants are subject the same regulatory scrutiny and control.

Trade/Customs Facilitation

For companies accessing global supply chains and with customers around the region and world, all efforts to streamline, make more efficient and clarify application of customs allows us to ensure the right product is delivered to the right customer in a cost efficient and timely manner. Creating uniform application of customs across the TPP partners is an essential element.

Customs/Rules of Origin (ROO)

Harmonisation of ROO across TPP partners and the region is also of great benefit to the manufacturing sector. ROO's should be easy to use, objective, transparent, and predictable. They should work in concert with commercial realities and support importer-focused trade facilitation measures (such as using self certification process agreed in the US-Korea FTA).

AUSTRALIA-GCC FTA

In addition to the TPP, Australia is also engaging with other regional economic entities, such as the Gulf Cooperation Council (GCC). The Gulf has tremendous potential to grow exports of Australia's commodities, as well as manufactured goods to satisfy growing demand across the GCC countries.

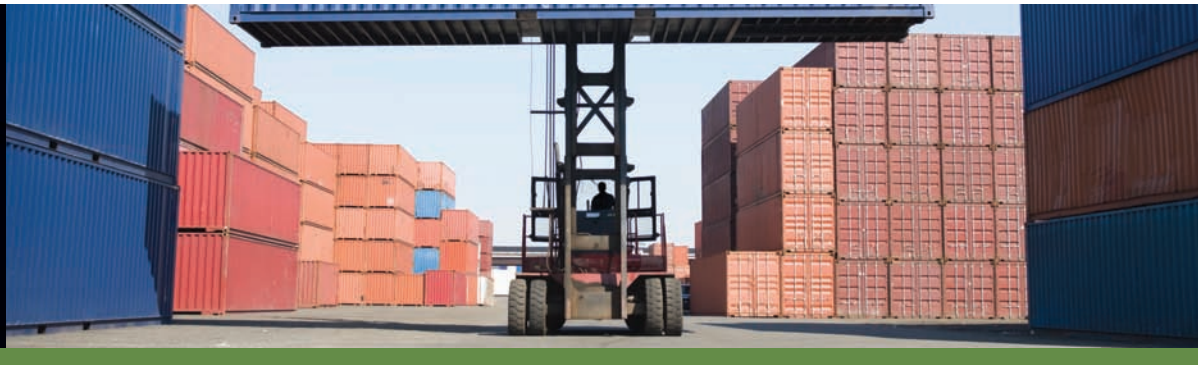
THE WTO DOHA DEVELOPMENT AGREEMENT

The Doha Round, underway since 2001, is the world's most significant opportunity to lower tariffs and remove barriers to the free flow of goods and services around the world. Australia has been a very active and engaged world partner in the WTO negotiations. Unfortunately, progress on these negotiations has been minimal particularly in area of wholesale tariff elimination in key industrial sectors.

In the interest of promoting advanced manufacturing, the mandate of the WTO should be amended to focus core rule-making issues, including trade facilitation, intellectual property protection and dispute resolution. As a nation with a keen focus on research and new technologies, Australia has a significant interest in strong protections of intellectual property.

REGIONAL/MULTILATERAL RECOMMENDATIONS

- Work aggressively within the TPP to build capacity for further liberalisation in key emerging markets.
- Set the highest possible standard through strong commitments to address "behind-the-border" impediments to trade and investment through tariff reductions, regulatory certainty, customs facilitation and harmonising Rules of Origin.
- Engage constructively with key trade promoting companies to develop a constructive, positive agenda for the WTO that includes the gains made to date in the Doha Development Agenda but also focuses on core WTO responsibilities such as dispute settlement and rules-making.
- Work with the WTO leadership to launch a work program on developing core investment principles to support foreign direct investment and fair treatment for all companies.



Anti-dumping

OVERVIEW

In the 1970s-80s, Australia's anti-dumping system proved to be of positive benefit to the economy at large in supporting stable business conditions for both local industry and long-term importer/suppliers and thus supported the consistent provision of needed goods and services to downstream industries. More recently there have been major changes in the Asia-Pacific industrial environment from which the Australian economy should, ideally, be able to derive economic benefit in terms of enduring competitive cost inputs.

It is notable that an unfortunate outcome of the anti-dumping system, as it is currently legislated and interpreted, is that it is open to misuse and may, to the extent it is abused, protect uncompetitive local industries and deny access of downstream industries to globally-sourced products and technologies at a competitive cost. Therefore, the system is in need of significant revision in order for it to deal effectively with a new era of international investment in production capacity particularly in the Asia-Pacific region.

WHAT MORE IS NEEDED

In general, the administration of the current antidumping system is highly weighted towards a strictly accountant-driven process with little regard for business intentions or the usual conventions and mechanisms surrounding the conduct of any particular business under investigation.

Experience demonstrates that dumping is intermittent, but is short-lived in the face of an effective anti-dumping application. In the majority of instances, dumping activity occurs during periods of rapidly changing prices which are the result of economic disruption at a regional Pacific or global level, or the entry of new, aggressive exporters seeking position in the Australian market. Whereas the aggressive behaviour of new entrants can result in injurious dumping, the instance of apparently dumped pricing due to broad economic disruption, if viewed in suitable time-frames, may not correlate with intentional dumping, injurious or otherwise.

The time period over which normal values are assessed is a critical element given that intermittent dumping involves short-term shocks to pricing. The time period should be longer and potentially, in the case of long term importer/suppliers to the Australian industry, be multiple years.

RECOMMENDATIONS

- Better define and reform anti-dumping policies in order to ensure that economic rationale and analysis are prioritised over a political or social value.
- Increase transparency in the anti-dumping system as it currently can be contradictory and obscure and does little to engender confidence that the formal assessments of non-injurious pricing, material injury and causality are managed in an impartial and equitable manner.

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Public Private Partnership

OVERVIEW

Partnerships between the business community, government and academia are perhaps the most common thread running between countries that are succeeding globally. It is most prevalent in the planned economies, but free markets are also increasingly developing effective versions in order to compete. We need committed partners acting in good faith, thinking long-term, and investing again in manufacturing and innovation.

The previous notion of a public private partnership, one where a private entity contracts with a government body to provide a public service (most often infrastructure), while still important is also evolving. More than ever public private partnerships are about businesses, government and academia working together to make strategic choices about the future and how to achieve the necessary transformation to a diverse and sustainable advanced manufacturing economy. No one sector can do it alone.

The relationship between industry and public sector research organisations (PSROs) is a link that is often undervalued. As the Australian Academy of Technological Science and Engineering (ATSE) points out, research has shown that private industry derives a greater benefit from collaboration with PSROs rather than turning to academic journals for latest research. Unfortunately, Australia ranks near the bottom of OECD countries in terms of this sort of collaboration.

In today's global economy, it is essential to develop effective collaborations to begin identifying priority industry sectors and developing strategies with a focus on propelling the most impactful future technologies into the marketplace. Public private partnership and an efficiently operating free market economy do not have to be mutually exclusive.

WHAT MORE IS NEEDED

The US Advanced Manufacturing Partnership is President Obama's task force that unites top U.S. engineering universities, leading manufacturers, and federal science and technology agencies to enhance U.S. manufacturing competitiveness, overcome market failures, and promote economic growth and job creation in the U.S. The AMP is conducting its work through a series of work streams; each with specific deliverables and activities:

- Advanced Manufacturing Technology Development
- Policy
- Education & Workforce Development
- Developing the "Industrial Commons" through Shared Capabilities and Facilities
- Communications & Outreach

Previously, the Department of Innovation, Industry, Science and Research (DIISR) has stated a goal of doubling the level of collaboration between industry and PSROs by 2020. This is a laudable aspiration that will require a keen focus and innovative policy approaches. We see four main categories by which partnerships are most impactful and should be prioritised. They include:

- Strategic Priorities
- Research Collaboration
- Commercialisation Potential
- Infrastructure Investments

Strategic Priorities

As has been discussed throughout the AMP-Aus, Australia would derive great benefit from identifying competitive opportunities for advanced manufacturing with a focus on the megatrends driving today's and future global challenges. However, it is not government's role alone to identify these strategies. It is imperative that government, business and academia are all part of this process. The US Advanced Manufacturing Partnership should serve as a model. This partnership brings together government agencies, manufacturers and academia to identify the technologies of the future and recommend the infrastructure, workforce needs and public policies that are required to support the development of 21st century solutions. Such a collaboration should be implemented in Australia with accountability for actionable recommendations.

Research Collaborations

It is becoming ever truer that the previous model of large corporate research labs running the entire R&D process for a single company are a thing of the past. Effective partnerships with government and research organisations are critical for finding new solutions. Australia deserves credit for recognising this. Organisations like the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Australian Research Council (ARC) through its Linkage Grants, ATSE and others have developed strong frameworks for innovation-focused partnerships. Additionally, Cooperative Research Centres (CRC) link researchers with industry to focus on R&D in order to progress towards commercialisation. Unfortunately, funding for CRCs is a target in the current budget climate.

Commercialisation Potential

A key outcome from a 2011 ATSE workshop was the recognition that the Australian Government must seek greater collaborations with private industry, particularly in "appropriate disciplines, and to encourage a top-down embrace of collaborative innovation." This will require continued and enhanced resourcing of key efforts bringing industry and academia together to incentivise the commercialisation of innovative technologies and explore funding models to increase access to capital. Commercialisation Australia is an intriguing model, working with businesses and researchers to bridge the so-called "valley of death". Over the past 2 years, they have invested more than AU$47 million across 119 projects. This needs to be scaled up.

Infrastructure Investments

The most commonly recognised model for public private partnership, strategic planning for infrastructure investments across Australia requires genuine collaboration between government and business. Infrastructure is critical for the long-term competitiveness of any country. Working together on major infrastructure projects to meet the nation's strategic needs including highways, railways and pipelines, government and industry can identify financing options, create efficiencies, and defray risk.

RECOMMENDATIONS

- Create a mechanism modelled after the US Advanced Manufacturing Partnership to enhance collaboration across the business community, academia and government to foster an advanced manufacturing environment.
- Streamline the ARC Linkage Grant application and decision process in order to invite active participation. In addition, reduce the matching requirement particularly for SMEs.
- Strengthen funding for CRCs, particularly those with a direct application to advanced manufacturing industries.
- Enhance resources for government industry collaborative efforts including Commercialisation Australia and Enterprise Connect to help bring innovative technologies to commercialisation
- Infrastructure Australia needs greater representation from industries representing the strategic priorities.
- Partner with priority industries to provide support and expertise related to networking and gaining exposure for Australian-based manufacturers.

WHAT DOW IS DOING

- Dow's CEO Andrew Liveris is serving as co-chair of the Advanced Manufacturing Partnership (AMP) in the US. The AMP brings together government agencies, manufacturers and academia to identify the technologies of the future and recommend the infrastructure, workforce needs and public policies that are required to support the development of 21st century solutions.
- Dow and the Australian Institute of Bioengineering and Nanotechnology (AIBN) have established an agreement to advance research in areas related to sustainability needs in the future including next generation energy storage, photolithography polymers, and systems biotechnology.
- Dow AgroSciences LLC and the Victorian Department of Primary Industries have established a partnership for a significant collaborative R&D effort related to crop innovation.

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ACKNOWLEDGEMENTS

The Dow Chemical Company would like to thank the following organisations for their time and input into the AMP-Aus:

Australian Academy of Technological Sciences and Engineering (ATSE)

Australian Industry Group (Ai Group)

Commonwealth Scientific & Industrial Research Organisation (CSIRO)

Institution of Chemical Engineers (IChemE)

Marand Precision Engineering

Manufacturing Skills Australia

Plastics and Chemicals Industries Association (PACIA)

Qenos

University of Queensland

University of Sydney School of Chemical and Biomolecular Engineering

University of Technology - Sydney

UQ Australian Institute for Bioengineering and Nanotechnology (AIBN)


DOW