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FOREWORD

Welcome to Manufacturing Skills Australia’s report and action response on sustainability.

There is no doubt that there are challenging times ahead. Finding solutions to climate change and its myriad of implications is becoming one of the primary concerns faced by governments, industry and communities across the world. We know that our actions today, and our responses to this challenge, will have serious ramifications for the generations that follow.

Solutions will lie in our ability to think creatively, develop new ways of working and ensure everyone has the tools and abilities to play their part. On behalf of the Board of MSA, I encourage you to see MSA as a critical partner in ensuring your workforce is equipped for a sustainable future.

MSA is taking issues of sustainability seriously. It is chartered with providing leadership in workforce development for the manufacturing industry and sees sustainable tools and processes as central to achieving this goal. MSA already has a range of training products and initiatives that support sustainable outcomes for businesses, and is committed to continuing to stay at the leading edge of workforce development in this area.

This report is timely, sobering and yet exciting for the new possibilities it offers.

I am pleased to present to you ‘Sustainable Manufacturing – Manufacturing for Sustainability’.

Megan Lilly
Chair, Manufacturing Skills Australia
October 2008
EXECUTIVE SUMMARY

A skilled workforce is central to the continuing viability and success of Australia’s manufacturers in a global market challenged with reducing its carbon footprint, measuring and trading emissions and developing innovative, sustainable technologies. However, research shows that businesses and our workforce are not yet prepared for these challenges.

_Responding to climate change will require a fundamental shift in Australia’s approach to management and workforce skills. Reducing greenhouse gas emissions means new processes for industrial and agricultural production, new research and investment in low-emission technologies, new patterns of consumption, and innovative thinking in almost every aspect of business life._

_Heather Ridout, Chief Executive of the Australian Industry Group._

Manufacturing Skills Australia (MSA) is the national Industry Skills Council that is recognised by the Australian Government and the manufacturing industry to ensure that the present and future skill and workforce needs of enterprises are being met. It is committed to taking a proactive stand in addressing the sustainability skill challenges faced by more than 75,000 manufacturing businesses employing almost one million Australians.

Like most areas of the Australian economy, manufacturing is under intense pressure from the community, regulators and government to find, implement and manage sustainable solutions. These solutions will require a broad understanding of sustainability that engages all levels of the organisation and its stakeholders.

_The solutions to the climate change challenge must be found in removing the links between economic activity and greenhouse gas emissions. For Australia, the commitment to the mitigation of climate change can be seen as the reinvestment of a part of the immense gains that have come from accelerated Asian economic growth, in contributing to reduction of an adverse side effect of that growth. In this, we are in a privileged position._

_These realities need to be kept in mind if we are to retain perspective in the domestic debate about mitigation and the introduction of an emissions trading scheme._

_Ross Garnaut - Garnaut Climate Change Review Final Report_

Manufacturers need to engage new thinking, technologies and practices to meet the new challenges.

- International standards and protocols and increased compliance requirements mean that manufacturers will be required to measure, report on and improve their environmental performance.
- Community expectations will drive consumer choices to more sustainable products and services, and employees to more responsible and respected employers.
- Costs associated with compliance will increase while companies will come under greater scrutiny from financial analysts.
- Competition in the market-place will drive new inventions, innovation and technologies.

Key targets for manufacturing are in skills development, technological advances and the adaptation of lean, clean and green manufacturing practices throughout the organisation. Enterprises must develop an environment of innovation and participation from all employees.

Skills that support sustainability are already present in many existing MSA qualifications and the coverage is increasing with ongoing developments to target these critical skills. MSA is working extensively with stakeholders from all manufacturing sectors to identify the skill issues that are emerging with the drive for sustainability and to then develop new strategies and resources.

Currently available resources include Competitive Manufacturing units and qualifications that target sustainable manufacturing practice, and the Manufacturing Technology qualifications which address new and emerging technologies. MSA has developed manufacturing-specific units of competency dealing with sustainability which are available for all its qualifications. Further work is currently being undertaken to target high level skills required to develop sustainable organisations as well as the technical skills required to integrate new and emerging technologies and sustainable practices.
Adaptation to some of the possible consequences of climate change would test humans and their values and preferences in profound ways. Contemplating the adaptation challenges of people in future times helps to focus our minds on the more difficult dimensions of mitigation choices.

Ross Garnaut - Garnaut Climate

MSA is also developing qualifications and skills sets so that nationally recognised training programs are available to support up-skilling of existing employees, a major skilling issue for the 2.9 million workers that the CSIRO predict will need to retool and retrain for new technologies and work practices.

We must also be able to ensure that Australia’s economy is ready to compete in a global carbon future. This needs to include sustainable jobs in energy intensive, trade-exposed industries (EITE) and grab hold of opportunities to grow green jobs.

Sharan Burrow – ACTU President (5 September 2008)

The challenges and opportunities in striving for sustainability are significant and will require committed leadership and strategic solutions. MSA is committed to providing leadership and strategic skilling solutions to this important and urgent mission to ensure that sustainable manufacturing is endemic in all manufacturing practices and helps to pave the way for Australian industry.

Check out MSA's website for more information on our range of sustainability products.

### MSA's Sustainability products include:

#### Sustainability units, available for all MSA qualifications:
- MCMT272A Participate in environmentally sustainable work practices (AQF III)
- MCMT472A Implement & monitor environmentally sustainable work practices (AQF IV)
- MCMT672A Develop workplace policy and procedures for sustainability (AQF V & VI)
- Learning and assessment support resources for application of these units

#### Manufacturing Training Package MSA07

Competitive Manufacturing qualifications covering skills for sustainable practices throughout the organisation, at all levels:
- Certificate II in Competitive Manufacturing
- Certificate III in Competitive Manufacturing
- Certificate IV in Competitive Manufacturing
- Diploma of Competitive Manufacturing
- Advanced Diploma of Competitive Manufacturing
- Competitive Manufacturing Vocational Graduate qualifications – under development

#### Manufacturing Technology qualifications targeting sustainable technologies across the organisation:
- Certificate II in Manufacturing Technology
- Certificate III in Manufacturing Technology
- Certificate IV in Manufacturing Technology
- Diploma of Manufacturing Technology
- Advanced Diploma of Manufacturing Technology

with specialised pathways in:
- CAD/Drafting (Detail Draughtsman / Computer Aided Drafting)
- Manufacturing Operations (Production Planning / Estimation)
- Laboratory Operations (Scientific / Technical)
- Technical Officer (Quality Control / Non-Destructive Testing)
- Sustainability (Technicians / Supervisors / Managers) – under development
- Emerging Technologies – under development
INTRODUCTION

Manufacturing Skills Australia (MSA) recently established five strategic goals as direction for the next five years. Prominent in those was that MSA should take a strong leadership position in the preparation of the workforce for ‘green manufacturing’.

‘Sustainable Manufacturing – manufacturing for sustainability’ outlines how MSA is taking action to target the skills and approaches that will facilitate change throughout companies, ensuring that all levels of employees are equipped to participate in and contribute to sustainable operations.

There are many challenges as well as opportunities that arise from the growing pressure to find sustainable ways of conducting business. This paper focuses on the impacts on manufacturing firms of increasing compliance and regulatory issues, social expectations and demands for innovative technologies. The critical activity of developing the manufacturing workforce by implementing new skills, new technologies and lean manufacturing practices are suggested as primary strategies in meeting the challenges. In order to maintain viability into the future MSA believes that manufacturing enterprises must link sustainability with commitment and innovative thinking.

There is now an opportunity to stimulate new thinking and new practices in manufacturing, leading to truly sustainable manufacturing, to the benefit of companies, their workforce and the wider community.

The key sections of this paper include:

2. Targets for industry – An exploration of the skills, technologies and work practices manufacturing firms will need across their organisations.

MSA’s response to these key sections is threaded throughout – on how MSA’s carefully targeted training products ensure manufacturing enterprises can access the skills, technologies and work practices to ensure sustainability is central to all manufacturing processes.
3. Manufacturing Skills Australia – A skills response

The responses and strategies described are in keeping with MSA’s key goal to lift the overall skills level of the manufacturing workforce. The MSA responses are aimed particularly at existing workers. Raising, expanding and enhancing workforce skills are one of the prime keys to the continued success and sustainability of manufacturing.
1. DEFINING THE CHALLENGE

Climate change – global warming – sustainability

We are coming to know climate change and the resulting global warming, to be one of the defining issues of our time.

In 2007 the Intergovernmental Panel on Climate Change (IPCC) released their fourth assessment report, concluding that:

- Warming of the climate system is unequivocal.
- Humans are very likely to be causing most of the warming that has been experienced since 1950.
- It is very likely that changes in the global climate system will continue well into the future, and that they will be larger than those seen in the recent past.¹
- Climate change has the potential to impact on humans and our environment in such significant ways, that the hunt for sustainable solutions has become a primary focus of governments, industries and communities across the world.

In Australia, the Government has announced its intention to introduce a Carbon Pollution Reduction Scheme (CPRS) in 2010 with the aim of reducing Australia’s emissions of greenhouse gases. At the heart of the CPRS is emissions trading, in which the Government sets a limit on how much carbon industry can emit each year and sells permits up to this limit. Industry will compete in the market to purchase permits, creating an incentive to look for cleaner, less expensive, energy options. Under this Scheme, some businesses will be required by law to measure and report their emissions.

This presents a major challenge for the manufacturing industry sector which rates as Australia’s third highest emitter of greenhouse gases. Manufacturing companies will not only need to integrate processes for measuring, assessing and improving their environmental performance throughout their operations, but also develop new products and technologies that meet a variety of social, environmental and economic imperatives.

According to research conducted by the Australian Industry Group in 2007, one in four companies identifies climate change as presenting a high market risk to their business. However, one in two companies see it as providing a medium to high opportunity.² The difference will be in a company’s ability to harness the right skills and an innovative environment that can find creative, sustainable products, approaches, processes and technologies to meet the new challenges.

²2007 Australian Industry Group report on the findings of a national survey of environmental sustainable practices, Environmental Sustainability and Industry, Road to a Sustainable Future.
Drivers for sustainability

Sustainability has more than 100 definitions. The two most well known and accepted are:

“...using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be maintained.”

Australia’s National Strategy for Ecologically Sustainable Development (1992)

“...development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”


Sustainable outcomes for modern enterprises are those that make sense on the triple bottom line – taking into account economic, social and environmental performance.

The imperative to have a sustainable operation in this wider sense is becoming more critical as key drivers for sustainable manufacturing in Australia increase their influence. Key drivers facing Australian manufacturers include:

a) **International standards and protocols.** The United Nations Global Sustainability Protocol is developing binding international targets for pollution control, resource efficiency and deep institutional, economic and industrial restructuring. Manufacturing firms will be prime targets for controls.

b) **Compliance with regulations.** The need for cleaner production is becoming more critical in particular with the imminent implementation of a carbon emissions trading scheme. Without a change in practice and behaviour some manufacturing enterprises will be either pressured or legislated out of business.
c) **Community expectations of the impact of production and energy use on ecosystems.** Consumers and customers will continue to opt for environmentally friendly products. Employees will also vote with their feet – presenting further challenges for manufacturing industries already facing skill shortages.

d) **Risks and liabilities associated with investments.** Companies are coming under greater scrutiny from financial analysts with respect to environmental performance.

e) **Costs associated with meeting regulatory constraints.** The amount of environmental legislation is expected to increase. Monitoring, verifying and reporting on environmental performance will become a function of manufacturing enterprises.

f) **Market-competitive, environmentally-benign technologies.** The need to be sustainable will lead to new inventions in product and process technologies, providing opportunities for innovative enterprises.

The implications of these drivers for manufacturing are that we need to change our processes, our materials and our thinking at all levels of our organisations. We need a broad understanding of sustainability that permeates everything we do and that involves everyone in the organisation, including managers, employees and stakeholders. Managing for sustainability requires leadership, commitment and planning to a sustainability strategy that is nested within the core values of the business.

**We need a broad understanding of sustainability that permeates everything we do and that involves everyone in the organisation including managers, employees and stakeholders.**

A broad interpretation of sustainability has many factors, including:

- impact on the environment.
- health and safety of employees, visitors and the surrounding community.
- corporate citizenship.
- quality and efficiency of products and processes - not only to increase profitability but also to reduce consumption of raw materials and energy.
- design of new machines, equipment and systems.
- research into the use of different types of fuel and energy, materials handling, heating and cooling processes, the storage and pumping of liquids and gases, and environmental controls.
- research into the use of different types of raw and transformed materials.
- specification, selection, installation, management and maintenance of factory production and machinery.

**MSA's position:** MSA accepts this broad view of sustainability and is integrating skills that foster, encourage and support sustainability into all of its qualifications at all levels. MSA’s development and inclusion of guideline units of competency in sustainability will ensure that sustainability skills and knowledge become aspects of all work functions. We also recognise that firms will need specific expertise to review and monitor their practices and develop an environment of sustainability. MSA is currently researching these skill requirements to develop skills and training responses that target ‘sustainability’ functions in organisations. We will continue to monitor and respond to the impacts of sustainability drivers on manufacturing.

*More information on MSA’s sustainability products is available in section 3 of this paper.*
2. TARGETS FOR INDUSTRY – SKILLS, TECHNOLOGIES AND WORK PRACTICES

Green collar skills

Sustainability requires the commitment of the workforce and efficient use of workers. It also requires that industry is developing the skills that are needed. The recent CSIRO report to the Dusseldorp Skills Forum: Growing the Green Collar Economy, issues a warning that almost three million Australian workers will need to be trained or re-skilled by 2015. This will be in order to retool and re-skill for changing work practices and to adapt to new technologies and work roles. The report identifies Australia’s future key skill needs as being technical and trade skills, design and engineering, assessment and accreditation, reliable product and market knowledge, and supply and post-sale support.

Knowledge, skills and innovation are major drivers of prosperity, productivity and global competitiveness. The Australian Government, 2020 Summit

The report goes on to highlight findings that important green collar skills include:

- planning and design
- business leadership and entrepreneurship
- project management and procurement
- specific business management expertise (such as for architectural practice, broad acre farming, fleet management, specialist manufacturing and retail)
- trade skills (such as green plumbing, construction of energy efficient buildings, renewable energy, low input gardening)
- assessment of project requirements (such as specification of inputs, system specifications, access to finance, approvals requirements, total costs) and outcomes (such as water and energy use, efficiency, market value)
- marketing and communication.

MSA also sees the need for manufacturing workers to have the necessary skills to produce and service products used to support and promote sustainability. As the skills and creativity of our workforce will play an important role in the changing of behaviours and practices, it is imperative for us to view a sustainable operation in a broad sense and look to empower and skill workers at all levels.

Enterprises vary significantly in terms of how they allocate and define the responsibilities of their workforce. Whether they are production workers, trades people, technicians or managers, all have some form of responsibility for sustainability and environmental protection and compliance. Some larger enterprises will employ full time specialised managerial and technical staff, while others will delegate these responsibilities to existing managers, supervisors and other employees.

Companies will vary in terms of how broadly they regard sustainability and protecting the environment. Some firms will take a very narrow view related to waste minimisation and pollution prevention at a minimum compliance level while others will adapt the more broad interpretation outlined earlier in this report.

**MSA’s position:** MSA acknowledges that work functions and skill requirements will need to change in response to climate change and is committed to providing flexible training pathways and up-skilling options to help facilitate this movement. Suitable existing, new and revised units of competency will be offered and highlighted in training qualifications. They will be identified as discrete skill sets for existing qualified workers at all levels, leading to higher qualifications. Our industry research and close relationships with enterprises and industry organisations will help inform our ongoing development of new training pathways and skill development options.

In addition to the specific work on our qualifications, MSA will be seeking opportunities to implement training programs and workforce development activities that will enhance the skills base of the existing workforce.

More information on MSA’s sustainability products is available in section 3 of this paper.
Technological advancement

Manufacturing firms need to seek out newly available and emerging technologies and develop a stronger innovation culture that ultimately leads to the design and development of energy efficient and low wastage machinery, equipment and processes.

Productivity and technological improvements drive economic growth

- Work by Robert Solow and Moses Abramovitz published in the mid-1950s demonstrated that as much as 85% of measured growth in US income per capita during the 1890-1950 period could not be explained by increases in the capital stock or other measurable inputs.
- The unexplained portion has been widely attributed to the effects of technological change
- Between 50% and 60% of Australia’s economic growth since 1990 can be attributed to productivity improvements

This means that Australian workers will need the specific skills to deal with the new and emerging technologies that Australia will adopt as we address climate change, energy and resources conservation and global market challenges.

Industry also needs to take on the challenge and implications of technologies such as solar electrical systems, hybrid fuel and propulsion systems, alternative dynamic power generation devices, water and power management devices, treatment and recycling technologies.

Research and development will be applied to new materials that result in products with less embodied energy and that also have a higher factor of end-of-use recycling.

New and emerging technology can rapidly depreciate an existing skills base. The human capital of the existing workforce can become obsolete unless an organisation continually develops its workforce and provides training opportunities. Keeping the workforce up to date with technological change can become a significant competitive advantage.

‘Investments in technology invariably fail to reach their full potential if investments in skills aren’t optimised’ - Colin Steed, CEO of the Institute of IT Training, UK

MSA’s position: MSA is committed to maintaining the currency of its training qualifications and units of competency to ensure they reflect the latest manufacturing technologies and practices. This will be achieved through our continuous improvement strategy. Current developments in the technology cadetship qualifications will support even further technical skill development in the areas of emerging technologies. MSA is undertaking significant work in areas such as CAD, metallurgy and fibre composites. We are working on advanced manufacturing techniques and design. All of our qualifications will include units of competency that support sustainability and MSA will provide specific advice on how these can be best used.

More information on MSA’s sustainability products is available in section 3 of this paper.
Keeping it lean, clean and green – a sustainability strategy for manufacturing work practices

‘Lean principles and tools can be applied to any problem, including environmental ones’. ‘The lean mantra of eliminating waste supports sustainability perfectly’. The Association for Manufacturing Excellence in its publication, Green Manufacturing.

As a result of climate change and the introduction of a carbon emissions trading scheme, we know there is a growing need to educate our current and future workforce with the skills and knowledge required for cleaner production and better manufacturing practices.

The big ticket items for manufacturing are waste minimisation, new technologies and material use.

Lean manufacturing principles provide a strategic way forward for manufacturing industries. They provide critical elements in a sustainable operation.

Lean manufacturing principles:

- empower and engage employees at all levels of the organisation
- facilitate new ways of thinking that examine work processes and technologies to ensure efficiency and minimise waste
- educate all employees about waste and inefficiencies
- provide a language for communication throughout the organisation and a platform for leadership
- encourage an environment of innovation, learning and improvement
- encourage personal responsibility for engaging sustainable work practices.

“Cleaner production is a preventative company-specific environmental protection initiative. It is intended to minimise waste and emissions and maximise product output. By analysing the flow of materials and energy in a company, one tries to identify options to minimise waste and emissions out of industrial processes through source reduction strategies. Improvements of organisation and technology help to reduce or suggest better choices in the use of materials and energy, and to avoid waste, waste water generation, and gaseous emissions, and also waste heat and noise.”

- Wikipedia definition

<table>
<thead>
<tr>
<th>Cleaner production hierarchy</th>
<th>Knowledge and skills inputs</th>
<th>Knowledge and skills outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVOID</td>
<td>Ability to recognise cleaner production opportunities and to evaluate feasibility</td>
<td>Product design, selection of materials, production/assembly techniques, consumer use, managing products at end of life</td>
</tr>
<tr>
<td>REDUCE</td>
<td>Understanding of material flows and organisational processes</td>
<td>Processes designed for minimum waste</td>
</tr>
<tr>
<td>RECYCLE</td>
<td>Understanding the value of waste as raw materials in the production streams</td>
<td>Design of process/product to facilitate re-use, education of customers</td>
</tr>
<tr>
<td>TREAT</td>
<td>The identification of waste-streams and materials</td>
<td>Savings through better pollution control technology, reduction of waste treatment, transport and disposal</td>
</tr>
<tr>
<td>DISPOSE</td>
<td>Understanding of impacts and drivers of waste</td>
<td>Minimum impact on the environment</td>
</tr>
</tbody>
</table>

Table 1: The cleaner and leaner production hierarchy offers tangible benefits to the sustainable organisation.

Companies can develop a competitive advantage within their business by embracing technology that supports sustainable practices. This is further supported by implementing lean strategies to deliver products and services that have fewer environmental impacts.

Organisations can create opportunities by making this commitment. They can benefit from reduced employee turnover, reduced operating costs and increased profitability. Employees are more willing and choose to work in innovative, environmentally sustainable organisations that actively display a corporate social responsibility (CSR).

The skills and creativity of our manufacturing industry and its workforce and the ability to adapt and accept technological changes will play an important role in the changing of behaviours and practices to enable Australia to manufacture in an environmentally responsible way.

They will also assist in maintaining sustainable enterprises, ones that can meet the challenges of global markets and the global economy.
<table>
<thead>
<tr>
<th>Key Drivers</th>
<th>Forces of Change</th>
<th>Impact of Manufacturing</th>
<th>Benefits of Adopting Lean Manufacturing Principles</th>
<th>Requires Change in Behaviour</th>
<th>Requires Change in practise</th>
</tr>
</thead>
<tbody>
<tr>
<td>International standards and protocols</td>
<td>Legislation</td>
<td>Exposure to globalisation and competition</td>
<td>Meeting customer expectations</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Compliance with regulations</td>
<td>Enforcement of laws and regulations</td>
<td>Monitoring and reporting</td>
<td>Lower regulatory non-compliance risk</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Community expectations of the impact of production and energy use on ecosystems</td>
<td>Corporate Citizenship/Image</td>
<td>CEO, board shareholder commitment</td>
<td>Improve employee morale and commitment, Corporate Social Responsibility (CSR)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Risks and liabilities associated with investments</td>
<td>Business and societal pressures</td>
<td>Unsustainable practices a threat to survival</td>
<td>Improve environmental quality</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Costs associated with meeting regulatory restraints</td>
<td>Increasing cost of disposal, energy, materials</td>
<td>Cleaner Production</td>
<td>Reduce costs</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Market competitive, environmentally-benign industries</td>
<td>New inventions in product and process technologies</td>
<td>Quality and efficiency of products and processes</td>
<td>Improve process flow and reduce lead times</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 2: Lean manufacturing principles offer central strategies in addressing some of the key drivers for change.

**MSA's position:** MSA has been a leading resource in the development of lean manufacturing skills in Australian enterprises with the development of its Competitive Manufacturing qualifications and units of competency that target sustainability and lean manufacturing practices. These qualifications have received overwhelming support and they are MSA's flagship products. MSA is currently developing vocational graduate qualifications in competitive manufacturing. We will continue to develop these innovative qualifications as a major strategy for skill development in sustainability for manufacturing enterprises. MSA is also ensuring that suitable Competitive Manufacturing units of competency are available for use in all of our qualifications. A further enhancement to overall skills development and recognition is being wrought through our approach to the design of the single Manufacturing Training Package MSA07. This ‘warehouse’ approach will retain sector-specific qualifications yet break down many of the traditional barriers between manufacturing industry sectors. The efficiency gains from this innovation will provide distinct benefits to industry as a whole as well as individual firms and workers.

More information on MSA's sustainability products is available in section 3 of this paper.
3. MANUFACTURING SKILLS AUSTRALIA
– A SKILLS RESPONSE

MSA’s Role

Manufacturing Skills Australia (MSA) is the national Industry Skills Council that is recognised by the Australian Government and the manufacturing industry to ensure that the present and future skills and workforce needs of enterprises are being met. It is committed to taking a proactive stand in addressing the skill challenges faced by more than 75,000 manufacturing businesses employing almost one million Australians.

MSA continues to develop, supply and revise high quality, nationally recognised training and workforce development products and services in response to industry needs in this rapidly changing environment of climate change and new and emerging technologies.

MSA Sustainability skills development initiatives

National guideline standards for sustainability

MSA was the first Industry Skills Council to develop units of competency that target sustainability skills to measure, analyse, improve and develop resource use and work practices to reduce negative environmental impacts of work. In addition, MSA has adapted the three national guideline sustainability units for manufacturing industry application. These have been packaged and incorporated into qualifications and training plans for workers across all manufacturing sectors.

MSA's units available specifically for manufacturing sectors include:

- MCMT272A Participate in environmentally sustainable work practices
- MCMT472A Implement and monitor environmentally sustainable work practices
- MCMT672A Develop workplace policy and procedures for sustainability

MSA was central in the development of an extensive and comprehensive learning and assessment support resource developed by the Swinburne University National Centre for Sustainability. This was done in conjunction with the NSW Department of the Environment and Climate Change and the Victorian Department of Sustainability. This resource was widely researched and reviewed and is focussed on these three nationally endorsed units of competency. This valuable resource is available through the MSA web site.

Lean, green qualifications and units of competency

MSA qualifications contain units of competency that deal with waste reduction and minimisation and all aspects of lean manufacturing. MSA has ensured that these individual units of competency can be included in any of the MSA qualifications.

They can be used in specialist qualifications such as the competitive manufacturing or manufacturing technology qualifications. They can be embedded within existing training programs under the Australian Apprenticeships scheme or clustered into skills sets that can be used to up-skill existing workers.

The recently endorsed Manufacturing Training Package MSA07 contains nationally recognised qualifications in Competitive Manufacturing and Manufacturing Technology that span across the whole of manufacturing and cover manufacturing practice, or the ‘art and science of manufacturing’.

Skills for sustainable manufacturing practice

As well as covering ‘manufacturing practice’, the competitive manufacturing qualifications include system management skills used at all levels in manufacturing, culminating in the skills needed by people such as manufacturing team leaders and operations managers. The qualifications also cover the development of efficient techniques for cost reduction, quality and delivery time improvement, implementing change, staff morale building and safe and environmentally sustainable manufacturing.
The competitive manufacturing qualifications and units of competency provide training for people working in organisations about to start or further develop their competitive systems and processes. They allow training providers to deliver relevant training, assess competency against endorsed units, and award nationally recognised qualifications. The qualifications focus on being accessible to individuals and organisations initially implementing competitive manufacturing as well as organisations more advanced in their implementation.

**Competitive Manufacturing Vocational Graduate qualifications**

MSA is currently finalising Competitive Manufacturing Vocational Graduate qualifications to target the skill requirements at higher levels of the organisation. Because these new qualifications are not focused on entry level skills, whether that entry level is at team leader, supervisor or manager level, they have less emphasis on the initial use of the “tools” of competitive manufacturing. Instead they have more emphasis on skills needed to reinforce a competitive and sustainable culture within the whole of the value chain. This includes the alignment of a whole organisation to a competitive and sustainable way of being in order to move competitive manufacturing organisations to the next level.

**Skills for sustainable manufacturing technology**

**Technology Cadetships**

Technology Cadetships are flexible enough to develop a tailored package of skills that suit a variety of business or enterprise needs. The range of pathways includes:

- CAD/Drafting (Detail Draftsperson or Computer Aided Drafting (CAD) Operator)
- Manufacturing Operations (Production Planner, Estimator)
- Laboratory Operations (Junior Scientific Officer or Technician)
- Technical Officer (Quality Control Officer or Non-Destructive Testing Technician)

Technology Cadetships provide the cadet with not only specific technical skills but also analytical, problem solving and planning skills and they have a strong focus on flexibility and innovation. Importantly they are a great platform for further career development. It is possible go on to Certificate V and VI (Diploma, Advanced Diploma), and the Cadet may also obtain credit for Engineering Degree entrance.

The Manufacturing Technology qualifications are designed to skill people to work within a specific technical discipline as manufacturing technicians in areas such as metallurgy, mechatronics and robotics, computer aided drafting and design, product design, polymer technology, process management, metallurgy, quality assurance and technical officer. They provide an excellent avenue for embracing emerging technologies and can be used as a valuable tool in providing targeted training in sustainable technology development.

**Manufacturing Technology: manufacturing technology sustainability pathway**

MSA is developing a specific training pathway covering more in-depth sustainability skills relevant for manufacturing. This is being designed for training of specialist technicians and as as additional study for someone who may already be qualified in another manufacturing related discipline.

This new MSA sustainability qualification is based on a broader and deeper consideration of sustainability – one that goes further than the traditional areas of environment protection and waste and pollution control. This new pathway will support a combination of environmental skills and responsibilities with technical level skills in OH&S, community liaison, regulatory compliance, and quality.

MSA has also identified evidence of the need for a broader Industrial Ecology approach that looks at industrial business systems in association with their economic, social and ecological systems. This is a strongly emerging concept that can assist the development of sustainable manufacturing.  
(Source: CSIRO)

MSA is also conscious that the new pathway should not be so broad that it loses focus or manufacturing relevance. For this reason it is proposed that the new sustainability pathway consist of skills in the following areas:
• generic sustainability (the customised national guideline units)
• pollution control and waste prevention and management (the ‘brown’ sector) including:
  - water - storm water, wastewater systems, water treatment technologies, etc.
  - air and atmospheric pollution
  - energy use, conservation and re-use
  - noise prevention and minimisation
  - waste minimisation, handling and recycling
• hazardous materials and radiation
• conservation and natural resource management (the ‘green’ sector)
• compliance strategies and management including environmental auditing and environmental impact statements
• risk management and sustainability
• external/community liaison
• environmental and sustainability management systems
• cleaner production
• environmental markets (carbon trading implications)

**Manufacturing Technology: emerging technologies pathway**

Emerging technologies are a critical component of sustainable developments for industry. Responsive training solutions are essential to address skill needs as they emerge in this fast moving arena. MSA is currently developing an emerging technologies qualification pathway in collaboration with the Australian Industry Group. This work will also make units available across MSA qualifications to meet this important industry need.

All MSA units and qualifications, and further information on these projects can be accessed through the MSA website: www.mskills.com.au.

**POSITIONS VACANT:**

**SUSTAINABILITY PRACTITIONERS WANTED**

**Occupation Description:**

The ‘three pillars’ of smart, responsible, modern manufacturing are economic, social and environmental responsibility and sustainability. Those working in this field of sustainable manufacturing will provide the thinking and the technology required to produce goods in an environmentally friendly and sustainable way, and at the same time maintaining, if not improving productivity. Sustainability in manufacturing might include the development and implementation of new systems and procedures such as more-improved use of insulation, heat recovery, cogeneration, and variable speed drives, just to name a few.

Those working in the sustainability field may be involved in…

• designing new machines, equipment or systems
• carrying out research in the use of different types of fuel and energy, materials handling, heating and cooling processes, the storage and pumping of liquids and gases, and environmental controls
• the use computer-aided design (CAD) to assist in design and drawing
• specification, selection, installation, management, and maintenance of factory production and machinery
• setting up of work control systems. e.g. testing of equipment, to make sure that standards of performance, quality, cost and safety are met.

*Apply for this exciting new career now. At your local manufacturer.*
In Conclusion

The new world of sustainable technologies and work practices is undoubtedly a challenging and exciting emerging reality for the manufacturing industries. Key drivers of compliance, community expectations, risks, costs and market competition will ensure that those who don’t adapt will be left behind. The role that manufacturing will play in creating and shaping this world is significant and will require steadfast commitment and effective strategies that embrace the full extent of sustainable possibilities. A sustainable organisation will take a broad perspective of sustainability that includes environmental, social and economic criteria and engages the entire stakeholder community.

Critical elements will be in skills development, new, sustainable technologies and lean and efficient manufacturing practices. Manufacturing Skills Australia already has a range of training qualifications and units of competency that specifically support skill development in these areas across manufacturing. More are currently in process. MSA is committed to providing leadership in skills development for its manufacturing stakeholders as they prepare for the challenges ahead and respond to the skill needs of this evolving journey.

So buckle up, this could be the most important ride of your life.
## RESOURCES

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### Reference material

Australian Industry Group 2007, Environmental Sustainability and Industry, Road to a Sustainable Future

Australia’s National Greenhouse Accounts, National Inventory by Economic Sector 2006

Australian Manufacturing Workers Union, Making our future: Just transitions for climate change mitigation, 2008

CSIRO, Growing the Green Collar Economy, Report to the Dusseldorf Skills Forum, June 2008

Australian Industry Group Deloitte, National CEO Survey, Skilling for Innovation, April 2008

The Economics of Has-beens. Glenn MacDonald; Michael S Weisbach

The Association for Manufacturing Excellence in its publication, Green Manufacturing, case studies in Leadership and Improvement

BERR Economics paper, The Five Dynamics of Change in Global Manufacturing, Sept 2008