



# Green Jobs Illawarra Action Plan

A Report to the Honourable Nathan Rees Premier of NSW  
from the Green Jobs Illawarra Project Steering Committee



28 September 2009

The Hon. Nathan Rees  
Premier of NSW  
Parliament House  
Macquarie St  
Sydney NSW 2000

Dear Premier,

It is with great pleasure that I present to you, on behalf of the Green Jobs Illawarra Project Steering Committee, the Green Jobs Illawarra Report and Action Plan. The Steering Committee has made 20 immediately actionable recommendations for your consideration and looks forward to the opportunity of implementing them with your continuing support.

Yours Sincerely,



Arthur Rorris  
Chairperson

### **Green Jobs Illawarra Project Steering Committee**

Dr Troy Coyle	University of Wollongong
Susan Dixon	Department of Environment, Climate Change and Water
Dr Mike Donaldson	South Coast Labour Council
Leanne Grogan	Australian Industry Group
Roz Hall	Department of Environment, Climate Change and Water
Rhonda Lawrie	Industry and Investment NSW
Nigel McKinnon	Industry and Investment NSW
Dianne Murray	TAFE NSW – Illawarra Institute
John Murray	Department of Education and Training
Prof. Judy Raper	University of Wollongong
Mark Roberts	Department of Premier and Cabinet
Arthur Rorris	South Coast Labour Council
Clr Ben van der Wijngaart	Southern Councils Group
Terry Wetherall	Illawarra Business Chamber

### **Project Officers**

A/Prof. Ann Hodgkinson  
John Rainford  
Dr Karla Sperling

## **CONTENTS**

(i) Introduction

(ii) Executive Summary

### *PART A: AUDITING THE ILLAWARRA'S EXISTING GREEN INDUSTRIAL CAPACITY*

1. General Overview: Labour Market and Industrial Profile.....	15
2. Manufacturing and Construction.....	17
3. Renewable Energy.....	21
4. The Illawarra Community and Sustainable Infrastructure.....	24
5. Skills and Training.....	28
6. Research and Development.....	31

### *PART B: MOVING FORWARD*

7. Challenges and Opportunities: Green jobs in the Illawarra.....	39
8. Transforming the Illawarra: Conclusion and Recommendations.....	43

(iii) References

(iv) Bibliography

(v) Acknowledgements

(vi) Consultation List

## **(i) INTRODUCTION - About the Project**

### **Background**

In February 2009, the South Coast Labour Council commissioned a multi-disciplinary team of economists, human geographers, sociologists, educationalists, environmentalists and statisticians from the University of Wollongong to develop a plan for a Green Jobs Strategy.

The subsequent report, *Power to the People: Building Sustainable Jobs in the Illawarra*, formed the basis of a submission to the NSW Premier, Nathan Rees, on 16 March 2009. It outlined the funding requirements for a two-phase Green Jobs Illawarra (GJI) strategy. On 16 April 2009, at the Illawarra Jobs Summit convened to examine employment conditions in the region in a recessionary environment, the NSW Premier announced a \$250,000 funding package for the GJI initiative.

### **Purpose**

The purpose of this report, the first phase of the Green Jobs Illawarra initiative, is to provide an action plan for green job generation and industry development in the Illawarra, being the Local Government Areas of Kiama, Shellharbour, Shoalhaven, Wollongong and Wingecarribee.

### **Methodology**

A Project Steering Committee representing community stakeholders and the four participating NSW Government Departments came together in early May and developed a Project Overview and Workplan. This set out the aims of the Project, a detailed description of the tasks involved, and timelines for their completion. Three Project Officers were then appointed by the Project Steering Committee to research and assist in the preparation of the report. The methodology adopted was evidence-based within the tight time constraints of a short (twelve week) project. A review of the literature and the relevant legislation was carried out, and more than fifty industry and community representatives and academics were interviewed. A Community Forum, held on 16 July, was attended by some forty people, and a Renewable Energy Forum, held on 28 July, also attracted forty industrialists and academic specialists. An independent review process was also undertaken of the final draft of this report. The project team focussed on the following key areas of activity:

- Manufacturing
- Construction and Retrofitting
- Renewable Energy and Power Generation
- Research and Development
- Skills and Training
- Infrastructure and General Community Employment Opportunities

The report provides a preliminary audit of the Illawarra's existing green industrial capacity, an assessment of the region's future opportunities, and recommendations to strategically create green jobs.

Green Jobs for the purposes of this report are defined as - *positions in agriculture, manufacturing, R&D, administration and service activities aimed at alleviating the myriad environmental threats faced by humanity. Specifically, but not exclusively, this includes jobs that help to protect and restore ecosystems and biodiversity, reduce energy consumption, decarbonise the economy, and minimise or altogether avoid the generation of all forms of waste. (United Nations Environmental Program 2008)*

## (ii) **Executive Summary**

*The Climate change sceptics constantly scaremonger about the possible loss of jobs through the transition to a lower carbon economy. But they constantly fail to talk about the new clean jobs of the future which will arise from the introduction of the carbon pollution reduction scheme, the renewable energy target and energy efficient measures in the future. Kevin Rudd, July 30, 2009.*

### **The Challenge for the Illawarra**

*Green Jobs Illawarra* is a strategic response to three massive challenges facing the region. First, the impact of climate change policy on a regional economy reliant on steel, coal and heavy manufacturing. Second, the onset of the Global Financial Crisis (GFC) and third, a sluggish economy and the continuing inability of the region to recover from the downturn in the steel industry in the early 1980's and subsequent recessions which have resulted in unacceptably high levels of unemployment, particularly for youth.

This report turns conventional wisdom on its head by demonstrating that the region's coal, steel and heavy industrial base, the sectors that have exposed the region most acutely to the impacts of climate change response, the GFC and longer term structural economic weakness, in fact provide the foundations, and in turn competitive advantage, for the Illawarra in the emerging green economy.

### **Leadership in Green Technology**

In wave power technology, the Illawarra is home to a world leader, Oceanlinx. A significant number of other manufacturing companies in the region are also active in the green economy. From this base, public infrastructure spending, coordinated at the community level with longer term renewable infrastructure projects at the regional level, will increase participation in the green market and attract private sector investment, creating jobs.

A preliminary audit of the Illawarra's existing renewable energy manufacturing and generation capacity carried out for this study shows that there is significant scope for profitable investment. Policy settings, on the back of a multi-billion dollar stimulus package, are now in place at the national level to attract this investment. The recent approval of a large-scale wind farm project near Goulburn, and planning approval for a \$2 billion wind farm on the Mundi Mundi Plains near Broken Hill, provides an opportunity for the region's engineering and fabricating companies, particularly in servicing, repairs and maintenance. In addition, proposals advanced by the Southern Councils Group for community based wind farms in the region represent significant opportunities for jobs and industry growth.

The Illawarra community has also identified potential green jobs in a range of other areas including housing, retrofitting, food production and distribution, environmental restoration, waste avoidance, resource recovery and water recycling.

### **From Research and Development to Industrial Application: Bridging the Gap**

The Region has demonstrated its capacity to link the Research and Development resources of the University of Wollongong and the skills and training expertise of TAFE Illawarra to local manufacturing companies. The University is a leader in technology research with R&D specialisations in sustainable manufacturing, sustainable primary production, innovative infrastructure, and sustainable household and community options. In vocational training, TAFE Illawarra can deliver a range of new Green Skills courses and its Yallah Campus is being developed as a Green Skills Centre of Excellence.

A key finding in this report, reflected in several recommendations, is the critical importance of the demonstration phase in the process of research, development and application of new technology. Demonstration is essential not only for the practical application of experimental research and refinement of prototypes but also to attract investment, enabling further stages of technological development and industrial application here in the region, as opposed to off-shore options. Demonstration projects, particularly in green construction and renewable energy, are also important for stimulating consumer demand for green technology and in driving a community-based movement to continue the transformation of the region.

### **Steel Foundations for the Green Economy**

Over the next decade, Australia is required to generate 20 per cent of its electricity from renewable sources. Although wind, solar and hydro are the developed technologies that will initially provide much of this capacity, other technologies including bagasse and wave will also make significant contributions.

These and other prospective technologies rely on steel. Steelmaking, in turn, relies on coking coal. With local mines producing this coal, the largest steelmaking plant in the country, and a worldwide reputation in metal fabrication, the Illawarra is uniquely placed to retain its position as one of the engine rooms of the national economy by transforming its manufacturing base.

This also heralds a great opportunity for the creation of green jobs in the region and a massive abatement of greenhouse gas emissions. The construction of a cogeneration power plant at the Port Kembla Steelworks, with an investment of an estimated \$1 billion would create an estimated two thousand jobs over a three year construction. It would abate up to one million tonnes of greenhouse gas emissions a year that would otherwise have resulted from coal fired power generation. This would make it the largest carbon abatement project in the nation.

### **Moving Forward: Transforming the Illawarra**

The question for the region isn't whether or not to participate in the emerging Green Economy, for that is already happening. The real question is which parts of that economy should be targeted to ensure that the region is strategically positioned to enable the longer term transformation and development of key industries and to receive the maximum benefits in terms of sustainable jobs for the community. The following recommendations

are the immediately actionable components of an action plan to enable this transformation to commence and form the basis of a longer term blueprint:

## **RECOMMENDATIONS**

### **Recommendation 1: Green Street Project**

*The purchase of a 'street' of 8-10 building lots in the Illawarra to enable the construction of display homes that utilise a diverse range of available and experimental technologies to meet or exceed a range of sustainability criteria including:*

- *6 star energy efficiency building rating*
- *Harvesting and conservation of water to meet 100% of household requirements*
- *Domestic power generation to meet 100% of net household power requirements*

*This project could be undertaken either through the purchase of privately owned land or through Landcom's existing stock with the costs of land acquisition and construction to be recouped through the sale of the properties at the end of the display period. It is anticipated that this project would enable the participation of apprentices in the building trades, developing and demonstrating green skills. Additionally, this project would provide an opportunity to monitor and document social behaviour in relation to energy efficiency and general sustainability principles.*

*The Green Street concept could also be applied to a retrofitting project for the social housing sector. Maintenance, repair, and upgrading of social housing units are part of an ongoing program faced with the difficult problem of energy efficient expenditure reducing the overall level of maintenance provision. Funding structural refurbishment in the social housing sector embracing solar roof panels, solar hot water units, rainwater collection, and grey water recycling would complement the Green Street proposal.*

### **Recommendation 2: Iconic Public Buildings – Major Retro-Fit Project**

*The scoping and establishment of retrofit projects focusing on iconic public buildings in the region such as a Town Hall or a major civic building to showcase the use of renewable energy technology and sustainable construction.*

### **Recommendation 3: Wind Power Industry Development Strategy**

*Implementation of the NSW Government's renewable precincts strategic plan for the development of the wind power generation industry in the Illawarra to include the consideration of the current proposals developed by the Southern Councils Group focussing on 'community wind power generation'.*

### **Recommendation 4: Wave Power Technology– Centre of Excellence**

*Positioning the Illawarra as a 'centre of excellence' for wave power generation technologies by harnessing the existing R&D capacity of the University of Wollongong, the innovative manufacturing and engineering capacity of regional firms and by supporting cutting edge projects by international market leaders in this field, including Oceanlinx.*



**Recommendation 5: Port Kembla Steelworks Cogeneration Project**

*The facilitation of urgent discussions between the Commonwealth and NSW Governments, the steel industry and regional stakeholders to reach agreement on addressing and removing the outstanding barriers to the construction of the \$1 billion cogeneration facility at the Port Kembla Steelworks. This initiative would represent the largest carbon abatement project in the nation, equivalent to 1 million tons of green house gasses and directly creating an estimated 2 thousand construction jobs in the region.*

**Recommendation 6: Smart Grid Regional Trial and Broadband Rollout**

*The preparation, in consultation with Illawarra Local Government Councils, of a joint submission proposing the region as a location for the anticipated national Smart Grid demonstration project, and the initial mainland location for the upcoming National Broadband Network (NBN) rollout.*

**Recommendation 7: Illawarra Jobseekers and Government Funded Programs**

*A new pathway be developed for the referral of registered job seekers from Commonwealth employment agencies to training providers such as TAFE Illawarra, for short courses in suitable areas where there are demonstrated or projected labour shortages such as Insulation Installers in order to maximise employment opportunities that are created by current government funded programs.*

**Recommendation 8: Green Corp Illawarra**

*Initiatives recommended in this report should provide the basis for opportunities to train and employ job seekers in the region as part of an articulated strategy. Projects should be developed in consultation with regional training and employment stakeholders to be funded by the Commonwealth Government's recently announced Green Corp Program.*

**Recommendation 9: Transforming Manufacturing and Engineering Industry**

*Investigate funding sources to enable an assessment of green technology opportunities for manufacturing and engineering industries in the region. This assessment would include an analysis of each technology to identify market gaps and the capacity of local companies to take advantage of the opportunities.*

**Recommendation 10: Green Technology Innovation Advisory Service**

*Establish a Green Technology Innovation Advisory Service for small and medium sized firms in the Illawarra, linking local firms to University of Wollongong expertise. This service would be complementary to existing Commonwealth Government and University of Wollongong innovation initiatives.*

**Recommendation 11: University of Wollongong - Teaching and Training Capacities**

*The University consider further developing its role as a trainer of professionals in all facets of sustainable industry including consultants and advisers on energy efficient products and new materials and government environmental policies. The University's role may be enhanced by developing the following options:*

- *Investigate the need for multi-disciplinary degrees and post-graduate research projects to further develop sustainable products.*
- *Investigate opportunities to develop relevant multidisciplinary training programs (eg, professional development short courses in conjunction with TAFE Illawarra)*
- *Develop a Solar [or Renewable] Decathlon event in conjunction with 'Green Street' or similar project.*
- *Sponsor a business planning competition in conjunction with the existing Trail-Blazer program to encourage new innovation and start ups in 'green' businesses.*

**Recommendation 12: Professional Development Short Courses**

*Specialised courses for local manufacturing organisations be offered, promoted and developed by TAFE as a matter of urgency in order to improve the overall resource and cost efficiency of production operations and improve their capacities to manufacture new environmental products in line with the objectives of the Manufacturing Skills Industry Council. These specialised courses should include training for employers and employees in sustainable workplace auditing.*

*While the inclusion of sustainability units in TAFE Illawarra training courses will lead to a general upgrading of skills in the regional workforce, it will take some time before this knowledge becomes commonplace in the majority of local businesses. Thus, the immediate priority is to provide additional short courses to increase sustainability skills and knowledge in the existing workforce, focussing on the major concentrations of regional employment. A number of these courses have already been developed.*

**Recommendation 13: Green Technology Demonstration Spaces**

*Demonstration facilities for sustainable residential innovations including prototypes of household level devices be provided, in conjunction with 'Green Street,' as part of a student eco-housing competition, and/or in conjunction with TAFE Illawarra sustainable building training facilities. This will address the limited local opportunities that currently exist to develop prototypes of household level devices and to demonstrate them to potential commercial partners.*

*It is further recommended that a process of evaluation and improvement be included in sustainable housing options increasing the exposure and engagement of the community and local businesses to potential commercial partners.*

**Recommendation 14: Sustainable Construction and Training Partnerships**

*Partnerships be developed between NSW TAFE – Illawarra Institute and regional stakeholders to undertake sustainable building projects designed and constructed to teach sustainable building skills, and then used by the contracting party in situ, where it may also be possible to monitor and evaluate innovations included in those buildings.*

*TAFE Illawarra currently has contracts to build demountable cabins for local governments. These provide three work teams of 18 pre-apprentices with training for the first two stages of an apprenticeship, which greatly enhances their employability. On completion the buildings are taken by the contractor organisation while the students usually find employment with builders to complete their apprenticeship. With suitable sponsorship, this program could be used to teach and demonstrate sustainable building skills.*

*Options include:*

- *Planned Local Government holiday cabin construction projects*
- *A small project team be set up between TAFE Illawarra and the University of Wollongong to design a building to be used to both teach sustainable construction skills and act as a public demonstration site for commercial builders and to showcase new residential sustainable technologies and emerging innovations.*

**Recommendation 15: Aquaculture Research and Application**

*Further consideration be given to the research and development of aquaculture technology such as the current project being developed in the Shoalhaven. These projects require skills, training and technical support from TAFE Illawarra and the University of Wollongong, the development of viable business plans and ‘seed’ funding to support the first stages of their operation.*

**Recommendation 16: Carbon Foot-Print Software**

*The University of Wollongong investigate the feasibility of establishing a business consulting facility through its Carbon Central Computing Institute (CCCI) linked to existing local ‘footprinting’ consulting companies to commercialise its business solutions software capabilities.*

**Recommendation 17: Green Jobs and the Aboriginal Community**

*The expansion and enhancement of Bushcare and Landcare type initiatives in consultation with the Aboriginal communities of the region focussing on increased Indigenous enterprise formation and employment in green jobs. This should include enhanced support for the delivery of business and project planning as well as ‘on the job’ accredited training, technical research and support services.*

**Recommendation 18: Community Engagement in Sustainability Initiatives**

*The NSW and Local Governments to support the establishment of ‘neighbourhood climate change/sustainability groups’ in each of the region’s five local government areas. These groups would promote and encourage community action for adopting sustainable practices at the household and neighbourhood level. Schools and other community groups would be particularly encouraged to participate and play a leading role. This recognises that sustainability practices, including reducing energy consumption, is not just a matter for regulation by governments - households must also be encouraged to be a part of the solution.*

**Recommendation 19: Advancing Green Jobs Illawarra**

*It is recommended that the Green Jobs Illawarra Project Steering Committee, be expanded to include additional community representatives and continue as a discrete task focussed project group of an appropriate regional organisation such as the newly established Regional Development Australia – Illawarra. It is further recommended that the Project Steering Committee be provided with adequate resources including funding for a project co-ordinator for an initial 3 year period to enable the implementation of the Green Jobs Illawarra Action Plan and the development of a longer term blueprint for regional transformation.*

*The immediate role of the Green Jobs Illawarra Steering Committee and its Project Coordinator would be to oversee the implementation of key recommendations of this report such as the Green Street and iconic buildings retrofit projects and to organise a major conference in the Illawarra on the theme of Green Jobs. The Steering Committee would also be charged with developing medium and longer term strategies for the sustainable transformation of the region's industries such as financing options for major renewable energy and other regional green jobs projects and infrastructure requirements for a transformation to a green economy including:*

- *Early access to National Broadband Network and smart grid (energy) initiatives.*
- *Integrated passenger transport systems and freight transport opportunities*
- *Incorporating green jobs initiatives and strategies into the existing major strategic plans for the Illawarra such as the Illawarra Regional Strategy and the State Plan as well as the strategic directions for the new RDA Illawarra.*
- *The identification of and planning for renewable energy precincts in the Illawarra.*

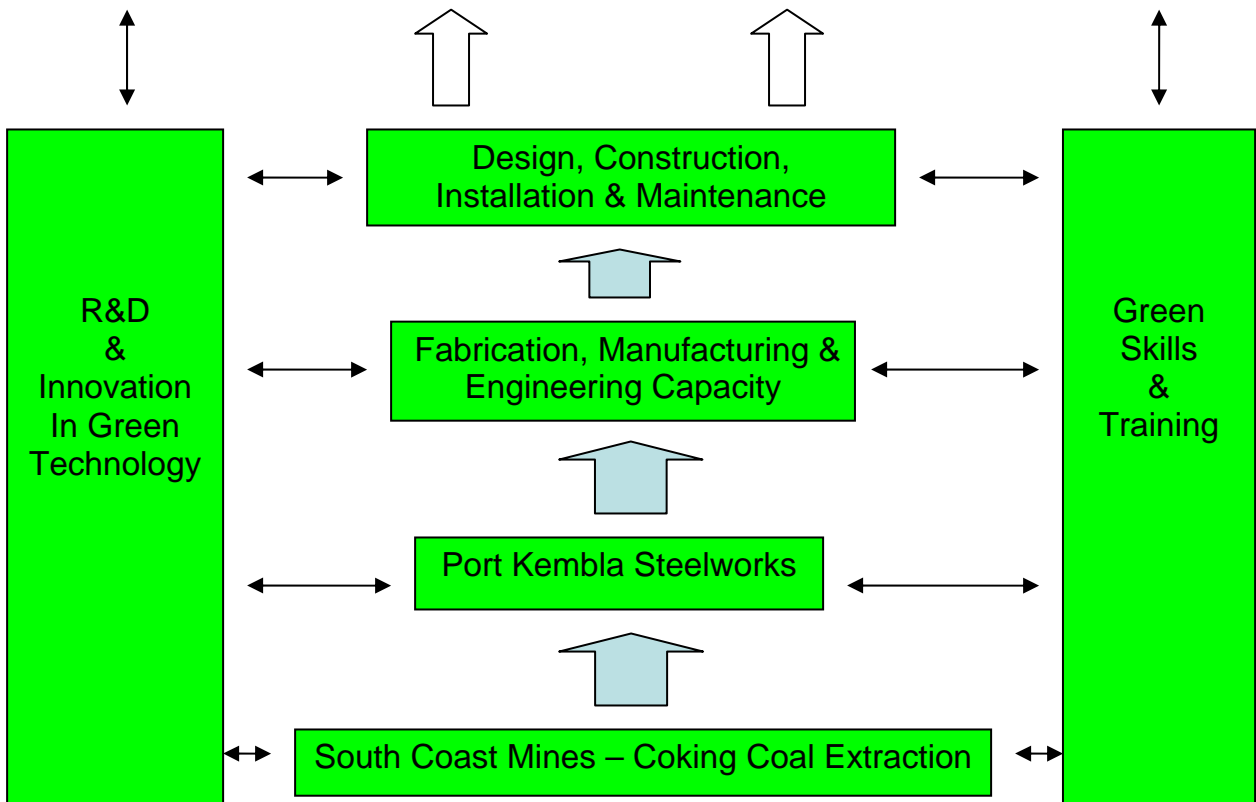
**Recommendation 20: Green Skills and Training - \$150,000 Allocation**

*It is recommended that the \$150,000 funding commitment for green skills and training be utilised for the following employer/employee short courses to be provided by TAFE Illawarra:*

<b>Suggested Programs</b>	<b>Course duration</b>	<b>Cost per course per person</b>	<b>Minimum number of participants per course</b>	<b>Number of Courses to be offered by 30 June 2010</b>	<b>Total</b>
Participate in Environmentally Sustainable Work Practices	1 day	\$200	Ten	20	\$40,000
Statement of Attainment in Policies, Procedures & Practices for Sustainability	7 days	\$1200	Ten	1	\$12,000
Environmental Sustainability in the Workplace	1 day	\$200	Ten	15	\$30,000
Saving Energy in the Workplace	1 day	\$200	Ten	20	\$40,000
Home Sustainability Assessment	4 days	\$700	Ten	3	\$21,000
<b>TOTAL</b>					<b>\$143,000</b>

*These courses will complement the findings and recommendations in this report in relation to skills and training from the Green Street Project through to Green Corps Illawarra.*

# From Coking Coal Mines to Renewable Energy Turbines: *A Production Process in the Green Economy*



## ***Part A - Auditing the Illawarra's Existing Green Industrial Capacity***

### **1. Context: The Regional Labour Market and Industrial Profile**

The Illawarra region comprises the five Local Government Areas (LGAs) of Kiama, Shellharbour, Shoalhaven, Wingecarribee and Wollongong. Covering 8,524 square kilometres and stretching south from Sydney to Durras Waters, the region has a population of 418,062, almost half of whom live in Wollongong.<sup>1</sup>

The region's labour force is 170,670, with employment by occupation indicative of the area's changing economy. Professionals are now the region's largest occupation, having overtaken Technicians and Tradespersons since 2001. The three largest industries in the region, accounting for almost 40 per cent of employment, are Wholesale and Retail Trade, Health and Social Assistance, and Manufacturing. In the period 2001-2006, the only employment growth of any note occurred in the public sector. Wholesale and Retail Trade employment decreased by 1 per cent in this period, and Manufacturing employment by 2 per cent.<sup>2</sup>

Despite its long-term decline, the manufacturing industry remains the largest single contributor to the Illawarra's Gross Regional Product – at a level significantly higher than the manufacturing sector's proportion of NSW Gross State Product and Australian Gross Domestic Product.<sup>3</sup>

Recent job losses at Pacific Brands and Kembla Grange Precision Tube typify a continued migration of manufacturing jobs which now co-exists with burgeoning underemployment resulting from the Global Financial Crisis (GFC).

The Illawarra has long had labour market participation rates well below state and national averages. In June 2009, with Australia's national unemployment rate at 5.7 per cent, and NSW's at 6.5 per cent, the rate in the Illawarra had already reached 9 per cent. The Illawarra is one of the seven worst hit locations in Australia to be supported by the Prime Minister's \$650 million Jobs Fund, announced in April 2009. If the forecast 8.5 per cent national unemployment rate is typically followed, unemployment will rise to 11.5 per cent in the Illawarra in 2010 and will take until 2015 to return to its 'natural' rate. A report prepared for the Australian Local Government Association suggests that the Illawarra's unemployment rate could rise to 15.2 per cent by March 2011.<sup>4</sup>

Declining manufacturing and the GFC are not peculiar to the Illawarra. Nor was the industry restructuring from the early 1980's which began with BHP employing more than 20,000 at its Port Kembla Steelworks. However, the economic contraction of the 1980's was more pronounced in the Illawarra than the rest of Australia. It was exacerbated by a 40 per cent reduction in the Region's coal industry workforce, higher than average job losses in the manufacturing sector, and lower than average jobs growth in the service sector.<sup>5</sup>

The recession that followed saw regional unemployment rise to 14 per cent in 1991, and for the rest of the decade, high levels of unemployment were the norm. The slow but steady improvement in employment levels evident from the second half of 1999 stalled in mid-2002 despite relatively low participation rates throughout this period. It took until September 2007 for unemployment levels to begin falling again, interrupted by the effects of the global recession which reversed this trend from November 2008. In the months of May and June, 2009, the region lost 5,800 full-time jobs together with 1,300 part-time jobs. Participation rates plummeted to 55.7 per cent and the region's unemployment rate for those aged 15-24 stood at 17.4 per cent.<sup>6</sup>

Manufacturing in the Illawarra is dominated by BlueScope Steel. Of the 792 manufacturing firms in the region, half employ 4 people or less and 85 per cent employ less than 19 people. One third of the Region's manufacturing workforce of 18,000 are direct or contract employees of BlueScope Steel.<sup>7</sup>

Integrated steel mills such as BlueScope's Port Kembla plant need to operate at 75 per cent capacity to meet costs. However, capital intensity requires 100 per cent capacity to achieve reinvestment profit. The global steel industry is presently operating at 73 per cent capacity due largely to increased production in China courtesy of that country's \$740 billion stimulus package.<sup>8</sup> The road to recovery seems unlikely to be short.

Climate change policies will dominate the future direction of the region's manufacturing and construction industries. Over the next twenty years in Australia, across six industry sectors of sustainable energy production and use, the number of jobs are projected to increase by 216,000. With supportive policies, these jobs could increase by 519,000 from the present level of 112,000.<sup>9</sup> Government decisions will heavily influence both the rate of green jobs expansion and the level of participation of the Illawarra's workforce in that growth.



## 2. Manufacturing and Construction

### 2.1 Overview

The Illawarra has a significant number of large, medium and small manufacturers particularly in the engineering, metals and metal fabrication sectors. Their manufacturing is a key regional specialisation, which will contribute to sustainable development in the Illawarra both in terms of internal efficiencies and as manufacturers of sustainable innovations developed through the University of Wollongong and elsewhere.

A number of local firms are participating in business support programs offered by the NSW Government. These programs include DECCW's *Sustainability Advantage* which provides workshops, training and technical assistance to promote innovation, lower resources and energy costs, improved productivity and supply chain connections. *Sustainability Advantage* has a Wollongong Cluster, facilitated by 'Business Treading Lightly' (established under an Environmental Trust grant) as well as the Illawarra Resource Recovery Cluster which includes participants such as BHP Billiton/Illawarra Coal, Bluescope Steel, Port Kembla Port Corporation and Port Kembla Coal Authority. Other Government programs in which businesses can participate include Enterprise Connect, Retooling for Climate Change and the Green Building Fund

Charting the breadth and depth of the Illawarra's contribution to the development of green markets is a necessary first step in encouraging their expansion. The substantial growth that has already been achieved includes: entrepreneurs such as the Gerringong-based ABC Wind, promoting small and medium scale wind energy solutions for regional Australia; Private Parts Engineering at Bomaderry manufacturing small-scale wind turbines; Rewind Energy's recent installation of the region's first wind turbine; Dux solar hot water systems manufactured in the Southern Highlands; Azure Energy's thermoelectric solar energy systems production at Heathcote; the development by CPE Systems in Nowra of control systems that improve the quality and production yield of solar cells; the regional recycling projects; the Wollongong-based energy-efficiency consultants HATCH, and the engineering services firm Worley Parsons.

Importantly, in terms of immediate job creation and longer-term transformation, the Illawarra has a demonstrated capacity to link the Research and Development resources of the University of Wollongong and the skills and training expertise of Illawarra TAFE to local manufacturing companies already engaged in the domestic and international green market. The following examples illustrate some of these links in manufacturing as well as existing capacity in the construction sector.

#### **Example M1: Wave Power Generation – *Oceanlinx***

Formed 12 years ago, as Energetech Australia Pty Limited, Oceanlinx is an Australian-based international renewable energy company specialising in wave power generation. Oceanlinx has attracted significant financial support from investors and government bodies in Europe, the USA and Australia. The company is currently planning projects in

the USA, southern Africa, the UK, Portugal and Spain. Its pilot project at Port Kembla has also led to the investigation and development of two projects at King Island, Tasmania, and Portland, Victoria.

Oceanlinx's key competitive advantage in an emerging industry, which has the potential to supply 10 per cent of global electricity, stems from the development of its Oscillating Water Column Device which incorporates the Denniss-Auld turbine. This innovative technology, which markedly increases the efficiency and flexible end-use of ocean resources (it can also be used to produce potable desalinated water) has been constructed, tested and maintained over a number of years at Port Kembla in association with local companies that include ABB, Nepean Engineering, Vale Engineering, Able Diving, Freestlye Composites, BASS WEE and TPE. The University of Wollongong has provided research, particularly in the area of developing mathematical models for the project, and maintains a cooperative agreement with Oceanlinx under an Australian Research Council linkage project.

The company's third generation technology is currently being designed and will have an installed capacity in excess of 2.5 MW. A demonstration version of this new model is presently under construction by local manufacturers. For Australian projects there is a real opportunity for fabrication and integration to be centralised at one location, creating a centre of excellence in the Region.

As projects overseas come to fruition, it is expected that foreign local content obligations will stipulate that basic construction be carried out at locations near the selected sites. However, Oceanlinx considers there to be particular merit and export opportunities in establishing a cost-effective Illawarra manufacturing capability for its key technology, the patented Denniss-Auld turbine.

### **Example M2: Wind Power Generation - *David Brown Gears***

David Bown Gears (DBG) is a world leader in the design and manufacture of gears - from the involute helicoid worm thread to Tracked Vehicle Transmissions. From its Illawarra base in Bulli, DBG services a wide range of Australian industries including power generation. It has the capacity to produce wind turbine gearboxes that are presently imported. It also has well established export markets in Malaysia, Singapore, Indonesia and the Philippines. Associated companies in the USA and France are involved in solar and wave energy production.

DBG is competing for wind turbine service and repair contracts in Australia, offering not only repair, but value-added solutions to operational problems unforeseen by overseas suppliers. It is one of the few companies in Australia with the potential to produce nacelles - the enclosure at the top of the support tower containing the gearbox, generator, transformer and yaw and pitch mechanisms, all of which are currently imported. DBG has an ongoing relationship with the University of Wollongong in relation to the development of its Test Rig Unit. It is also an Illawarra company that continues to hire employees in the midst of the global recession.

### **Example M3: Solar Power Application - Partech Systems**

Established in 2000, Partech Systems Pty. Ltd. is a wholly-owned Australian company located at the Shoalhaven Aviation Technology Park in Nowra. The company provides support services in Avionic Test Engineering to the Australian Defence Forces and is involved in rail infrastructure with Downer-EDI Rail.

In conjunction with the University of Wollongong, Rail Innovation Australia and rail infrastructure suppliers, Partech Systems is presently developing an innovative, fail-safe, solar powered level crossing system which applies a number of new technologies to level crossing safety. These include mesh network communication devices, satellite communications for fault reporting and monitoring, and low-power solar technologies. This system has a potentially large domestic market and offers the prospect of a much larger export market. With local production, accessing these markets would result in the creation of a significant number of green jobs in the Illawarra.

### **Example M4: Construction and Retrofit - BlueScope Buildings**

BlueScope Buildings, a division of Australia's largest steelmaker, BlueScope Steel, specialises in the design and construction of industrial buildings and has operations in North America, Asia and Australia.

The company is a member of the Green Building Council of Australia active in the development and implementation of Green Star rating methods and systems. It has completed numerous projects in Australia. Successful projects in the Illawarra include the Patrick's Autocare facility at Port Kembla Harbour and the aircraft hangar at Albion Park.

The company also designs and constructs school halls and Covered Outdoor Learning Areas as part of the *Building the Education Revolution* program. It has the capacity to meet the rollout requirements of this project, complete with insulation, solar panels, solar hot water systems and water tanks.

BlueScope Buildings has the technical, production, and organizational capacity to rapidly complete public and private sector projects that incorporate renewable energy and other environmentally sustainable principles and Green Star rating methodologies.

BlueScope Water, also a division of BlueScope Steel, is Australia's largest manufacturer of treated-steel rainwater tanks. Over the last two years, it has completed more than 300 school retrofit projects nationally, including at least 10 in the Illawarra. It is able to deliver a green retrofit package of solar, rainwater, energy-efficient lighting and other passive solar solutions. The company is presently involved in six State and Commonwealth government water conservation programs. According to Commonwealth government sources, the Building the Education Revolution project has a potential requirement for 6,500 rainwater tanks nationally.

### **Example M5: Construction – *University of Wollongong and Industry Innovation***

The University has substantial laboratories to test new structural construction technologies and to research the incorporation of sustainability principles in building design to provide flexibility in future building usage, thus extending their lifetime. It is working on the inclusion of environmentally friendly structural components in the Green Building Council 6 star rating system.

Cement production is one of the heaviest energy users, and pricing carbon will change the relative costs of different construction options. New concrete mix materials are being developed in collaboration with a local cement manufacturer to produce stronger pre-stressed concrete with reduced emissions. Pre-stressed concrete is initially more expensive but produces a lighter building, which offsets the higher initial per unit cost. A software tool exists to compare the benefits of the different options. These products are ready for commercialisation, with relative costs dependant on different carbon prices and sizes of the projects. Some specialist contractors in the Illawarra can already use these products but others will require additional training.

Illawarra companies such as Australian Steel Mill Services and SCE Group are involved in producing construction materials from recycled products. Slag can be used as a cement replacement (20% to 40% depending on slag quality) in concrete which reduces the products carbon footprint. It is relatively slow setting which can delay the building process. One local company is developing a granulated slag powder as a substitute for cement in concrete. Another is producing slag-based pavement materials and supplies slag-based aggregates utilizing 100 percent recycled materials for road bases, construction and landscaping. It also supplies slag to glass container and float glass manufacturers in Australia and Asia.

### **Example M.6: Sustainable Housing - *SOS Shoalhaven***

Community understanding of sustainable housing is considerably enhanced by the construction of low environmental impact homes which are typically displayed for 12 months prior to being offered for sale. The recent opening of the ‘Sustaining Our Shoalhaven’ SOS House Project demonstrates the success of these schemes.

The Shoalhaven sustainable demonstration house showcases a range of sustainable construction materials. Bricks are produced from recycled timber waste. Another manufacturer of doors and window frames from sustainable forest woods processes the wood shavings into biomass fuel briquettes. Recycled organic materials are composed into soil improvement agents. There are a number of companies in the region providing environmentally friendly architectural coatings.

More than 100 people have viewed the home each week, and the home’s sponsors report that all of them go away with ideas of how to make their own homes more sustainable. The success of the Shoalhaven project supports the ‘Green Street’ recommendation in this report by extending this concept to show the feasibility of green suburbs.

### **3. Renewable Energy and Cogeneration**

#### **3.1 Wind Power**

Wind power generation is one of the world's cheapest renewable energy sources. At present there are 47 wind farms operating in Australia with an installed capacity of 1476MW. While this accounts for almost 40 per cent of the renewable energy sectors output, it is still less than 1.5 per cent of national electricity needs. There is considerable growth in the sector with 6 large wind farms under construction with an installed capacity of 535MW. A further 76 wind farms are under development with installed capacity in excess of 5800MW. This market will grow substantially in order to meet the Renewable Energy Target of 20 per cent by 2020. Industry estimates are that over the next decade some \$25 billion will be invested in renewable energy with between \$5 billion and \$12.5 billion directed to wind power generation.<sup>10</sup>

*Environment Victoria*, estimates that the Australian wind industry already employs more than 2000 people. However, there is enormous potential for growth in employment as the sector scales up to meet the 20 per cent renewable target. Internationally, the wind industry is a major employer where supportive policies exist. The Southern Councils Group identified 160,000 people directly employed in the European wind industry in 2008 and noted that 16,000 new jobs were created in Denmark alone between the mid 1980s and 2002.

In the development of wind resources NSW has been slow, but a boom in the construction of wind farms is now commencing with the recent approval of a large-scale project near Goulburn, and planning approval for a \$2 billion wind farm on the Mundi Mundi Plains, near Broken Hill.

The NSW Government is establishing Renewable Energy Precincts across NSW in areas with the best known wind resources as a strategic approach to streamline the planning and approval process for wind developers. Precinct Advisory Committees will be established to address the need for improved community consultation and for proponents to engage with the community early in the project lifecycle and assessment process. The South Coast, including parts of the Illawarra, is one proposed Renewable Energy Precinct and presents an opportunity to assist consideration of actual future wind power generation proposals in the region.

The Southern Councils Group, for example, is considering a wind project which has the potential to provide significant benefits to the Illawarra. The viability of local wind power generation was confirmed in its Concept Study Report which identified high potential sites in the Shellharbour, Kiama, Wingecarribee and Shoalhaven LGA's, able to deliver 20 Megawatts of power from between 6–10 turbines.

The challenge for industry is to bridge the gap between the region's general manufacturing and engineering capability and commencing wind and other renewable energy manufacturing operations. This is a critical part of the transformation process in

the green economy, and will require a comprehensive assessment of specific capacities and requirements for each production process. Whilst this analysis is beyond the scope and limitations of this report it is addressed in the recommendations as an important part of the action plan.

Indicative of the market potential is the major contract for the fabrication of towers for the Capital Wind Project near Lake George in NSW which has been secured by RPG Australia. Located in Dalby, Queensland, RPG is planning a \$20 million investment which will create up to 45 long-term jobs.

### **3.2 Biomass**

Perhaps more than any other method of generating renewable energy, biomass has the scope for immediate job creation. In Germany in 2006, 91,900 people were employed in the bioenergy industry, in comparison with 73,800 people employed in the wind sector.

Two companies in the Illawarra are involved in the production of biomass energy. Manildra, which produces ethanol at Bomaderry, and National Biofuels, that is developing a site at Port Kembla to produce biodiesel from imported soy beans. Other biomass facilities, such as the proposed installation at the Wollongong Sewage Treatment Plant, use gas produced by the decomposition of waste material to generate power. A major regional study of options for resource recovery from households and industry is currently being undertaken by the Southern Councils Group and is supported by the Department of Environment, Climate Change and Water.

### **3.3 Cogeneration and Trigeration**

Much of the recent innovation in clean energy technology and infrastructure has occurred with cogeneration and trigeneration. Cogeneration involves producing both heat and electricity from the same energy source. There are two approaches to this method of generating power, by using gas which would otherwise be wasted as a by-product of an industrial process or by constructing new generating capacity using one or more renewable energy technologies, in combination with fossil fuel generation. While cogeneration involves the use of heat from an industrial process to create electricity, trigeneration combines the production of electricity, heat and cooling. Technologically, it is about connecting cogeneration units with an absorptive cooling unit.

#### **Example E1: Cogeneration - *BlueScope Steel***

BlueScope Steel has invested \$80 million to examine the construction of a cogeneration plant at its Port Kembla Steelworks. The plant would be fuelled from by-product steelmaking gases, avoiding the release of up to 1 million tonnes of GHG emissions per year into the atmosphere. It would employ an estimated 2000 people during construction. The 225MW of electricity capacity would be used by the Steelworks, with surplus fed into the grid. The proposed plant, which would require a further \$1billion investment, is currently on hold as a result of the continuing effects of the GFC and uncertainty

surrounding the implementation and effect of the Commonwealth's Carbon Pollution Reduction Scheme.

A cogeneration plant is critical infrastructure for the steelworks which will ensure its modernisation and the maintenance of its internationally competitive position. This in turn makes it a critical project for the region's participation in the green economy given the importance of steel production in the growth of renewable energy and sustainable construction industries.

**Example E2: Cogeneration - *Sydney Water Wollongong Project***

Sydney Water will install a new facility at the Wollongong Sewage Treatment Plant to convert biogas, a product of the wastewater treatment process, into electricity. When operating, the facility is designed to produce 500 kW of power.

## **4. The Illawarra Community and Sustainable Infrastructure**

### **4.1 Overview**

This report acknowledges that many community organisations have already contributed to the creation of environmental awareness and laid the foundations for recognition of the importance of green jobs. Two local organisations, the Futureworld Eco-Technology Centre and Healthy Cities Illawarra, have been particularly active in building the relationship between a sustainable economy and a healthy environment.

Community consultations, together with a Community Forum held on 16 July, 2009, identified five key areas with the potential to generate green jobs in the Illawarra:

- Transport Infrastructure;
- Food Production and Distribution;
- Environmental Restoration;
- Waste Avoidance; and
- Water Recycling.

### **4.2 Transport Infrastructure**

Further investment in public transport infrastructure and in active transport (walking and cycling) has the potential to create green jobs through both the construction of new infrastructure and the maintenance of existing infrastructure.

The region's transport planning strategy recognises the importance of sustainable transport, and the need for improved transport infrastructure was recognised with the construction of Grand Pacific Drive, resulting in the successful promotion of the region as a tourist destination. A similar strategy based on increasing the number of visitors travelling by public transport and bicycle would bring further tourism to the region complimenting existing local community demand for these services.

#### **Example C1: *The Gong Shuttle***

The Gong Shuttle, a free bus service connecting Wollongong CBD with the University and surrounding suburbs is used by an average of 2,000 people a day. Another free shuttle bus which links the University with North Wollongong Railway Station has increased the patronage of the station by 14 per cent.<sup>11</sup>

### **4.3 Active Transport**

Thousands of people participate in the Sydney to Gong bicycle ride each year. Cycleways throughout the Region provide a valuable community resource. Well designed cycling infrastructure with designated bike lanes, together with restrictions on parking, is transforming the urban environment of major international cities such as London. This



approach could be applied as a longer term strategy for the Illawarra with the aim of Wollongong becoming a leader in sustainability.

#### **4.4 Food Production and Distribution**

Primary production plays an important role in the Illawarra as evidenced by the \$20 million oyster industry in Shoalhaven. Employment in food production could increase substantially with a coordinated program that builds on the recommendations of previous reports such as the South Coast Agricultural Diversification project.<sup>12</sup>

#### **4.5 Reducing Food Miles**

To reduce the 'food miles' associated with the transport of food from remote locations, local food production is essential. Reducing the amount of energy consumed during the production and distribution of food is a key objective of community organisations such as Food Fairness Illawarra, which promotes local food production as an element of food security and sustainability.

#### **Example C2: *Farmers Markets and Community Gardens***

Farmers' markets are located throughout the Region in Bulli, Coledale, Dapto, Gerringong, Jamberoo, Kembla Grange, Kiama, Shellharbour and Wollongong. These markets provide the basis for a more sustainable system of food distribution which creates green jobs and leads to greater food security. Community gardens, including those located at Dapto and North Wollongong, deliver social and environmental benefits. A current community education project which recognises the importance of such initiatives is Sustainable Illawarra. With a three year Environmental Trust grant, the Illawarra Biodiversity and Local Food Strategy for the Climate Change project will be carried out by 2011, providing impetus for local food production in accordance with a community supported agricultural model.<sup>13</sup>

#### **4.6 Environmental Restoration**

#### **Example C3: *Landcare and Bushcare***

A network of community groups including Landcare and Bushcare, comprising both volunteer and professional workers, provide environmental restoration services in bush regeneration throughout the region. By maintaining the biodiversity values of land containing important natural habitat, particularly in National Parks and on council community land, these groups perform a vital community service. With ongoing support for environmental restoration work on important bushland, which includes biodiversity found nowhere else, the number of green jobs will be increased and the threat of weed and feral animal invasion will be reduced.

#### **Example C4: *Warrigal Project***

The Warrigal project is a successful regional example of an Indigenous business that has established a market for local plant species. By recognising the expertise and knowledge of Indigenous land managers and fostering a greater understanding of Indigenous use of plants for food and medicine, this market could be significantly expanded.

#### **4.7 Waste Avoidance and Resource Recovery**

Waste avoidance aims at reducing the amount of waste sent to landfill or other forms of disposal. Unlike waste disposal, waste avoidance, re-use and recycling can reduce both resource and energy use. Due to an increased amount of handling of materials, which would otherwise be regarded as waste, re-use and recycling also results in more green jobs.

#### **Example C5: *Wingecarribee Shire Resource Recovery Centre***

The Resource Recovery Centre operated by Wingecarribee Shire Council is a successful business established in the region based on the reuse of products that include building materials. Twenty five people work in resource recovery in the Wingecarribee, leading to a substantial reuse of material which would otherwise have been dumped as landfill.

#### **4.8 Water Recycling**

#### **Example C6: *Wollongong Recycled Water Plant***

The Wollongong recycled water plant, commissioned in 2006, is one of the largest industrial recycled water projects in Australia. The plant supplies up to 7.3 billion litres of recycled water each year to BlueScope Steel's Port Kembla steelworks. Under stage two of the project, recycled water will be supplied to the Port Kembla Coal Terminal, Wollongong Golf Club, and nearby City Council Parks, replacing some 1.4 million litres of water each day.

#### **Example C7: *Northern Shoalhaven Reclaimed Water Management Scheme (REMS)***

Shoalhaven REMS is one of the largest and most complex water recycling schemes undertaken by an Australian local government water authority. It is being developed in two stages at a total cost of \$64.5 million and will utilise up to 80 per cent of the reclaimed water produced from six Shoalhaven City Council wastewater treatment plants to irrigate local dairy farms, golf courses and sporting fields. In the longer term, up to 1,000 hectares of land will be irrigated from the REMS.

The scheme has been in operation for seven years and has provided substantial benefits to the fourteen participating dairy farms. These include increases in pasture production and stocking rates as well as cost savings from the substantial fertiliser content in the reclaimed water. An initial financial study of the scheme found that each farm was

between \$50,000 and \$70,000 per year better off by irrigating with reclaimed water. Advice from farms indicated that the availability of reclaimed water has helped maintain, and in some cases increase, farm employment in the Shoalhaven region. Farms use up to 90ML of reclaimed water for dairy yard wash down, replacing the previous usage of potable water. The scheme has also allowed the previous discharge of treated effluent to Jervis Bay Marine Park to be phased out.

#### **Example C8: *Kangaroo Valley Sewerage Scheme***

Shoalhaven Water, in conjunction with the Department of Energy, Utilities and Sustainability, and the Sydney Catchment Authority, is developing a scheme for providing centralised sewerage services to the Kangaroo Valley Village. The scheme will protect water quality within the Kangaroo River catchment which is used extensively for recreation and also supplies drinking water for Sydney and the Shoalhaven.

As part of the scheme, a water reclamation facility will be constructed to treat all flows from the scheme to tertiary standard. An average of 95 per cent of the reclaimed water produced from the scheme will be used to irrigate pasture and crops on a local dairy farm helping to draught-proof the farm's feed supply.

#### **4.9 Indigenous Green Business Formation**

There is an obvious Aboriginal – environment connection through the 'Caring for Country' concept. Indigenous people combine an understanding of environmental issues with access to land and water via Land Councils and, in many cases, training in horticulture and/or conservation and land management. In addition to designated Aboriginal land managed by Land Councils, large tracts in the Illawarra region are managed by public authorities such as National Parks, Department of Environment, Climate Change and Water, Road Traffic Authority, RailCorp, Southern Rivers Catchment Management Authority, Sydney Water and local Councils. Private organisations including BlueScope, BHP Billiton, and other mining companies also have large land holdings. A number of initiatives to create Aboriginal employment in Indigenous-controlled enterprises have occurred, often associated with the old Commonwealth Development Employment Program.

Indigenous employment initiatives include Aboriginal cadet and Discovery ranger programs through the Department of Environment, Climate Change and Water with associated TAFE and University education; 'Green Teams' work crews through the Southern Rivers Catchment Management Authority to undertake environmental repair and manage important ecological sites; a native plant nursery with genetic research functions; Dunmore Recycling depot at Shellharbour; bush food production and tourism; aquaculture, and the new Jumbulla Gateway Aboriginal Cultural Centre. The Green economy offers opportunities in these and other environmental areas for Indigenous businesses to undertake environmental management contracts, establish primary production businesses, and provide educational / tourism services to schools and at significant Aboriginal sites in the region.

## **5. Skills and Training**

### **5.1 National Qualification Framework**

NSW vocational qualifications are determined within a national agreement between the States which ensures consistency in accreditation throughout the country. Within this system, Skills Australia acts as the peak body to advise the Federal Government on industry skills. Eleven national industry skills councils have been established which oversee developments in vocational education and training in their respective industry areas. It is the responsibility of these councils to identify and respond to the skilling needs of their industries and to develop appropriate training packages, which consist of a series of courses or sets of skills forming various levels of vocational accreditation.

Each council has examined the impact on their industry sectors of recent policy initiatives relating to Australia's progress towards a more sustainable economy. These include carbon pollution pricing and regulation and financial incentives to install solar heating systems, ceiling insulation, smart meters, water tanks and grey water recycling in residential, commercial and industrial facilities. Industry Skills Councils in areas most directly impacted by these changes have developed specific Environmental Scan documents. They have therefore identified a range of new skills and knowledge to be incorporated into existing qualifications, and in some cases entirely new courses will be required. In addition, short courses are needed to provide current tradespeople and other graduates with new sustainability competencies.

The Construction and Property Services, Electrocomms and Energy Utilities and Manufacturing Industry Skills Councils are most directly relevant to the Illawarra Green Jobs Strategy. However, most industry skills councils cover specific sectors identified as significant in the strategy.

### **5.2 NSW Government Green Skills Strategy**

The NSW Green Skills Strategy embodies the NSW State Government response to the 2009 NSW Job Summit. It aims both to provide the skilled workforce needed by industry and to educate workers on sustainability. CSIRO research has identified that by 2026 over half a million jobs will exist in environmentally impacted sectors, all of which will require new skills and training. A further two million workers in low impact sectors will also require some training in sustainability skills. At the same time, CSIRO has indicated that the existing green skill capabilities in the Australian workforce are poor.<sup>14</sup>

The NSW Green Skills Strategy Implementation Plan identifies the key environmental challenges, key environmental opportunities, the affected occupations and Government targets for each industry. These are then related to Industry Skills Councils, training packages and course units.<sup>15</sup> A version of this schema has been adapted for the Illawarra Green Jobs Strategy which relates Skills Councils, Training Packages, Occupations and Courses to possible Green Business Opportunities in the Illawarra. To this, new training requirements in terms of green competencies have been identified from the National

Skills Councils Environmental Scan documents. This allows the strategy to directly relate business opportunities, as identified elsewhere in this report, to training needs.

The Construction and Property Services Industry Council has emphasised the need for improved environmental performance which covers better work practices, improved waste management, more efficient design and construction of buildings, installation of new technologies, retrofitting or upgrading existing facilities and use of hazardous materials.<sup>16</sup> A sustainable pathway within the Manufacturing Technology qualification has also been developed.

### **5.3 TAFE NSW - Illawarra Regional Response**

TAFE Illawarra will draw on training resources developed throughout the State system and locally to implement new courses and competencies as identified in active consultation with industry stakeholders. A range of new courses are already available in conservation and land management, environmental monitoring and technology, architectural technology, sustainable building design, building surveying and building and construction.

#### **Example S1: TAFE NSW – Illawarra, Yallah Campus**

Funding has been provided under the *Better TAFE Facilities Program* to develop a new sustainable training capacity at the Yallah Campus in southern Wollongong with practical ‘hands on’ training resources. These will include accredited training in the design and installation of photovoltaic solar systems for electricians; accreditation for ceiling insulation installation; training for plumbers in installation of water tanks, grey water systems, and sustainable gardening. Sustainability units have recently been incorporated into the Business Services Training Packages and sustainability components integrated into standard trainee and apprenticeship training for all trades.

The Yallah Campus is proposed as a Green Skills Centre of Excellence. A certified Environmental Management System will incorporate a range of sustainability functions. It will be partly powered by solar, and include a sustainable training room for professional short courses incorporating features such as a composting toilet, water recycling and alternative construction materials. The site has the potential to demonstrate new sustainable building techniques, new technologies and other ecologically sustainable practices.

In order to upgrade existing vocational graduates in sustainability skills, a range of Graduate Development Courses are available. These include similar areas to those described above as well as refrigerants and hydrocarbons, chemical applications and sustainable building design. New commercial programs are available in energy and water saving practices for small and medium workplaces.

Currently, green skills developments in TAFE Illawarra focus on the building industry, organic production and horticulture, energy and water savings, and upgrading existing

certificate and diploma qualifications and apprenticeships to include units of competency in relevant sustainability skills.

The Director General of the Department of Education and Training has declared 2010 the Year of Learning for Sustainability for Schools and the Technical and Further Education sector. By the end of 2010, all TAFE students are to be given some skills for sustainability involving online induction and the inclusion of some sustainability units in all qualifications. TAFE Illawarra is working with the Centre for Learning Innovation at Strathfield to develop three units of competency in innovative learning for green skills. TAFE NSW is also working on a staff induction program on Education for Sustainability that will be delivered online to all NSW vocational teachers. A Graduate Certificate in Education for Sustainability is being developed at Swinburne Institute in Victoria and will be available for all teachers and trainers from 2010. There are also opportunities for TAFE Illawarra to work with the University of Wollongong to develop further qualifications.

## **6. Research and Development**

### **6.1 Overview: The University of Wollongong**

The University of Wollongong is a leading technology research university, with significant research activity at its main Wollongong campus, the dedicated Innovation Campus in Fairy Meadow, and at its Shoalhaven campus in Nowra. It also has teaching facilities at Loftus in Sutherland Shire, Moss Vale in the Southern Highlands, and Bateman's Bay and Bega on the South Coast. The research philosophy at the University is to encourage the commercialisation of its basic and applied research.

The University is one of the major sponsors of Futureworld Eco-Technology Centre, which showcases environmentally friendly technologies to the local community. Additional initiatives to demonstrate new innovations developed in the Illawarra are discussed below.

### **6.2 The Research and Development Process**

For this report, interviews were conducted with over 30 academics and researchers working in green research which has the potential to be commercialised. In this process, approximately 20 further academics were identified whose research was relevant to this strategy, although not as directly commercial as those interviewed.

Research is typically categorised as Basic, Applied and Commercial Development. Basic research is almost always conducted in public research institutions such as universities and government laboratories, and outputs are usually published and freely available. Applied research is often also conducted as public research, although it includes partnerships between academics and businesses. It thus often involves restricted intellectual property rights or commercial-in-confidence constraints. The link between basic and applied research is achieved through small-scale demonstration plants facilitating continuous modification and performance evaluation.

For Example, a new Processing and Devices facility, which will house 150 staff and students, is being developed on the Innovation Campus to support the commercialisation of research from the Australian Institute of Innovative Materials. It will support national and international collaborative partnerships to undertake research from the Institute of Superconducting and Electronic Materials and the Intelligent Polymers Institute, offering opportunities to transform traditional industries and develop new high-tech manufacturing industries, including those in the emerging energy sectors.

In addition to demonstrating new products and materials, this facility will demonstrate the equipment needed for the manufacture of these items, which offers further business opportunities in these sectors. Commercial development is primarily undertaken within business enterprises, which may contract with public institutions for research to overcome specific problems which arise in the commercialisation process. The link

between applied and commercial research is through pilot plants involving problem solving and evaluation.

In addition to academic research, commercial Research and Development is undertaken by all innovative local businesses. Effectively linking with University research is one crucial aspect of business innovation. The University has Research and Development specialisations relevant to developing a green economy in the areas of sustainable household and community energy options, sustainable manufacturing, innovative infrastructure, and sustainable primary production activities.

### **Example R1: *Sustainable Household and Community Options***

Small scale solutions target individual houses or a decentralised facility for a small community. This area has already been prioritised by state and federal incentive and training programs including ceiling insulation, solar hot water systems, smart meters, water-saving bathroom devices and energy-saving light bulbs. A range of new devices and processes which can be incorporated into sustainable housing options are being developed at the University. Sustainable housing options are a regional research strength where the Illawarra can become a leading national innovator.

### **Example R2: *Small Scale and Micro-Wind Turbines***

‘Wind farming’ is now a mature technology, with Research and Development primarily involving continuous product development in generators, turbine manufacturers and fabrication companies as discussed elsewhere in this report. Research into smaller scale options, either household installations or regional wind farms, is also a specialisation of the Illawarra, with a number of initiatives under development. The University provides expert advice and testing facilities to local companies developing these devices. Researchers are also developing improved versions of micro wind turbines, currently suitable for non-electrified rural areas which have potential for application in cities. Research on these devices is currently at laboratory stage but is ready for advancing to demonstration prototype and pilot, looking to commercialisation in 5 to 10 years. There is already considerable local interest and extant manufacturing capacity.

### **Example R3: *Membrane Water Filters/Water Recycling***

Ceramic membrane filters are now used for large-scale treatment of industrial wastewater at Port Kembla involving BlueScope Steel and Worth Recycling Pty Ltd, and are being tested for use in municipal water storage. Membrane technologies are being developed at the University providing low energy, low cost filtration which can be used to treat and recycle individual household grey water or ground water systems. The same technology can also be used in community-based waste water treatment where all households in a suburb or new development can be connected to a local treatment facility.

Polymer membranes are currently imported from North America. However, the University’s research capacity in nano-ceramics could be used to develop local manufacturing. Wetlands are used as water treatment facilities in a number of housing



developments in Wollongong. The University is currently evaluating the effectiveness of existing ponds, prior to extending these activities into new areas. The region has the capacity to integrate substantial water recycling capabilities into new housing developments and the retrofitting of existing stock with these new technologies within 5 to 10 years.

#### **Example R4: *Solar Photosynthesis***

The Intelligent Polymers Research Centre is a world leader in achieving greatly increased energy storage efficiencies with technologies combining polymers with light, harvesting materials. One potential application is to include these cells in roofing materials and this innovation is now being investigated with commercial partners in the Illawarra. The technology can also be applied to individual houses where solar power is collected from the roof for reuse, thus not requiring a grid connection if storage is included. It involves dividing energy into oxygen and hydrogen which can be stored separately and recombined when energy is needed. The technology could also be used as a solar power booster on gas power stations such as the one at Tallawarra. While this technology is longer term, being more than 10 years from commercialisation, it is now ready to move to demonstration stages.

Solar cell technology for use in windows has also been developed. This technology has been patented and is ready for licensing and commercialisation. New equipment has been designed and a prototype developed to 'print' solar cells, which is available to demonstrate to manufacturers. Opportunities thus exist for local engineering and fabricators to work with researchers to develop and manufacture this equipment, which would allow for continuous improvement and place the Illawarra as a world leader in this technology.

#### **Example R5: *Household Awareness, Audits, Advisory Services***

Householders' willingness to implement energy saving and renewable energy options is determined by the level of environmental awareness, knowledge of the properties of available options and their relative costs. The University is conducting a survey of Illawarra households to gauge their consumption patterns and capacity to become more sustainable. Research of this nature provides the basic information for developing audits and advisory services to increase the level of sustainability in Illawarra households and to determine future demand for innovations such as those described above. Researchers are also involved in raising awareness of environmental issues. Advisory services and audits represent growing opportunities for the establishment of new and expansion of existing small businesses and would be an immediate generator of employment for people trained through TAFE and the University.

### **Example R6: *Experimental Eco-Housing***

A range of options for designing, constructing and outfitting environmentally sustainable housing have been developed in the laboratory. Before these options can be commercialised, demonstration housing is required to showcase them to the public and potential manufacturers and contractors. One of several options for promoting sustainable housing raised in this project is a Solar/Renewable Decathlon to be held through the University where groups of students from throughout Australia meet ten challenges in relation to solar/renewable energies. Organisation of this competition through the University would support sustainable household innovations in the Illawarra, including retrofitting options, new designs for solar lighting, and solar cells for building roofing and cladding. A variation would be an expansion of the existing TrailBlazer competition into commercial applications through a business planning competition for sustainable innovations developed by the University. These competitions would encourage local construction firms and manufacturers of construction materials to develop their own commercial versions of eco-housing.

### **Example R7: *The Carbon Central Computing Institute (CCCI)***

Carbon footprinting represents an important opportunity for job creation and industry development in the region. The University's Carbon Central Computing Institute (CCCI) is developing software tools for enterprise level carbon footprint assessment to support businesses in reducing their carbon emissions. These include Business Process mapping to add sustainability management into the business case for different processes under investigation. This tool is ready for commercialisation. The carbon 'workbench' uses standard processes for modelling the business process but includes outputs as to the carbon footprint from the different processes being investigated. It is currently at prototype/demonstration stage. The Centre also has a capacity to provide a total assessment of alternative methods to achieve given goals which include quality of outcomes, energy costs, environmental impacts and production costs. The CCCI intends to establish a consulting service in conjunction with existing private enterprises to commercialise these tools.

In addition to software tools, the University has marketing expertise in areas such as sustainable tourism, public attitudes to water recycling, accounting expertise in carbon accounting and disclosure, and economic expertise in pricing environmental assets, which could also be included in consulting services.

University researchers have also produced software that includes carbon costs into building costings. As carbon is progressively higher priced, this will provide an incentive to reduce the cement content in buildings and influence construction towards more sustainable procedures. They are working with local manufacturers to reduce cement use in concrete, for example, by substituting slag, a waste by-product of metal manufacture, which reduces the carbon content of these products.

Researchers at the Centre for Atmospheric Chemistry have developed instruments to analyse the level of greenhouse gases in the atmosphere. These will have particular application in measuring emissions from agriculture when the carbon pollution reduction scheme is expanded. Once accredited through the United Nations, these devices will be ready for commercialisation and potentially local manufacture.

#### **Example R8: *Smart Infrastructure Institute***

The University has world-class laboratories for electricity grid, superconductor and structural building research. It has also recently established Australia's first smart infrastructure research and training institute. Developments in infrastructure depend on Government sponsorship. There is scope for the NSW Government to support job creation by investing in new generation infrastructure and by acting as a client for new sustainable energy devices. State sponsorship will provide a state and nation wide market for new products in these areas. The Illawarra can thus provide national leadership in infrastructure innovation.

#### **Example R9: *Railways***

The University has the most advanced laboratory for railway testing (gravel, sleepers, and tracks) in Australasia. Current rail research focuses on minimizing energy use. This requires significant improvement and realignment of tracks to reduce friction to allow the use of heavier, longer, faster freight trains and higher speed passenger trains, work which can be driven from the Illawarra. Improvements in rail energy efficiency requires substantial investment in track work, including sleepers and rails which can be easily produced in the Illawarra.

Green corridors, a concept developed at the University, can be implemented in conjunction with track improvements. Trees are planted along railway tracks which act as an environmental barrier to noise, as a windbreak, and to absorb carbon dioxide from diesel fuel. The tree roots strengthen the track foundations, and reduce water build up under the tracks. The South Australia and Queensland governments have expressed interest in improved track ways.

As clients, Rail corporations and the RTA can support innovations incorporating renewable energies such as solar into devices offering sophisticated smart applications in signalling, warning lights and barriers, etc. to improve safety and efficient running, with obvious benefits in rural and remote locations. One such device has already been developed to commercial stage by a manufacturer in the Shoalhaven with research support from the University. (See p23)

#### **Example R10: *Electricity Grid***

The University hosts the Integral Energy Power Quality and Reliability Centre which has been operating for fourteen years. The Centre is one of the world's leading research laboratories on how to manage the grid to maintain a clean supply of energy. Power

quality research contributes to efficient energy use in manufacturing. The Centre is also testing the impact of new energy efficient lighting on the quality of the power supply. It works with utilities in all States providing monitoring programs on network quality.

Renewable sources involve intermittent generation which affects the reliability of supply. The Centre is working with Country Energy on how to embed small-scale household generation into the grid. The coordination of different renewable energies is also under investigation. Nevertheless, storage is still a major issue with the use of renewable energy technologies. Batteries are needed to prevent blackouts from intermittent generation, but existing technologies result in significant storage losses. Superconductor technology offers an alternative storage option, although it is considered to be at least 10 years from commercial application. The University Institute of Superconducting and Electronic Materials, a world class centre in energy, superconducting and electronic materials, is researching the use of superconductors for energy storage. Magnetic coil energy storage technology for renewable energies is also being developed at the University. In the shorter term, they can be used as fault current limiters to protect the grid from blackouts due to intermittent generation.

The University originally established a company in the Illawarra to commercialise superconductor technologies, but due to slow progress, it was absorbed into the global energy company Zenergy. Intellectual property developed by the University is now commercialised through this company or licensed globally. There are some commercial applications of these devices in the USA, and they could be developed for use in NSW with the support of the State Government. If these technologies were to be used in the Australian grid, they could be manufactured locally. Australia has the requisite technical capacity but Australian utilities will need to commit to the use of new technologies to support the development of this manufacturing capacity. The Queensland government is expressing interest.

### **Example R11: *Alternative Fuels and Nano-Materials***

The Institute for Superconducting and Electronic Material's research on the use of lithium batteries in hybrid cars has developed to commercialisation stage but is being manufactured overseas. Research combining superconductors with nano-ceramics can displace batteries as a power source for electric cars. This process is now being commercialised in the USA. Nano superconductors are relatively cheap and safe to produce and could replace lead batteries. While there are no Australian battery manufacturers at the moment, superconductor batteries are a new product and could be produced locally.

In addition to super conductors, nanocarbon electrodes have been developed for use in energy conversion and storage. These Li-ion batteries have superior efficiency and lower cost and have immediate applications for use in electricity grids in conjunction with renewable energies such as solar and wind. A second application involves the development of fuel cell batteries which can replace small batteries in mobile and remote devices. The technology is ready to scale up to prototype and for commercial licensing

and manufacture. While there may be cost advantages to manufacture overseas, location of these facilities on the Innovation Campus would allow collaborative development of further generations of this technology with local researchers placing the Illawarra at the leading edge. Local opportunities also exist to manufacture electrode materials for use in these batteries. Nano materials use relatively simple manufacturing techniques. They have a large number of potential applications but need to be linked to local manufacturers.

### **Example R12: *Sustainable Primary Production Activities***

There have been significant changes to the structure of the Illawarra economy in the past few decades which have resulted in a decline in traditional primary sector activities such as forestry, dairying and commercial fishing. Opportunities exist to develop sustainable small-scale farming, horticulture and aquaculture offering new employment opportunities using skills similar to those displaced by these structural changes. Activity, currently occurring mainly in the Kiama, Wingecarribee and Shoalhaven areas, can also be developed in the peri-urban fringe of Wollongong and Shellharbour.

### **Example R13: *Sustainable Aquaculture***

The Shoalhaven Marine and Freshwater Centre at the University's Shoalhaven Campus has a well developed proposal for environmentally sustainable aquaculture. As local commercial fishing has declined in line with policies to protect remaining fish stocks in the area, the Sydney market is progressively being serviced by imports for Asia, often from aquaculture projects. There is thus a substantial market for local aquaculture products. Both commercial fishers and local Aboriginal communities could be skilled to work in this industry.

The University project is currently preparing a business plan, and it has attracted some initial investment for the development of land-based integrated aquaculture projects that will comply with Australia's strict environmental regulations. Wastewater from the fish tanks can be used to grow seaweed and vegetables, which clean the water and recirculate it back into the tanks. This intellectual property is ready for commercialisation with three projects available to be established in the area. The proposal involves the development of a commercial scale hatchery, a demonstration scale integrated farm and training facility at Ulladulla, and would also incorporate the University's research centre and tourism facilities. The hatchery would supply a variety of species to local fish farming ventures, including a variety of different aquaculture species, mussel and abalone fisheries. Training would be provided by local TAFE courses, with technical support from the University.

To achieve commercial status, some transitional funding is required to support the hatchery until sufficient aquaculture projects have been established to make it self-sufficient. Aboriginal groups from Wollongong to Eden have expressed interest in developing aquaculture projects. These projects could be funded by the Indigenous Business Australia program but local communities require skills and technical training in

aquaculture technologies. The pilot has been built on Indigenous land with the support of the local community.

**Example R14: *Sustainable Small-Scale Farming***

Agriculture in the Illawarra predominantly involves beef and dairy cattle farming with some horticulture, particularly wineries, nurseries and hobby farming. Water shortages and quality have constrained the development of more intensive horticulture such as market gardens, organic produce, orchards, etc. despite the attractive landscape and proximity to Sydney. Reuse of waste water from sewerage treatment plants is one solution to this problem.

Together with Kiama Council, researchers at the University are currently investigating issues relating to rural landholdings. Two sustainable agriculture reports were prepared by the Southern Council's Group. The 2004 report identified the potential to develop new higher value products such as grapes, vegetables, fruit, flowers, organic and hydroponics crops, alpacas, fish, coffee, olives, ginger, poultry and other small animals, apiary, herbs and farm forestry. More recent research presents a similar picture. Examples of many of these activities can be found, but to date there has been no major expansion of these crops.

An expansion of this sector would add value, create jobs and expand tourism in the region. Activities such as farmers' markets, food trails and festivals add to the cultural vibrancy of the region, and thus its attractiveness for new investment. A comprehensive strategy would be required to support such activities including rezoning, access to agriculture Research and Development, financial packages, cooperative resource sharing and marketing, horticulture training (already available through TAFE Illawarra), and infrastructure and transport improvements in the peri-urban areas. Growth in this sector could occur within 5 to 10 years subject to the development and implementation of an appropriate strategy by local government authorities.

## ***Part B – Moving Forward***

### **7. Challenges and Opportunities for Green Jobs in the Illawarra**

#### **7.1 Overview**

For the Illawarra to retain its position as one of the engine rooms of the national economy it has to secure its existing employment base while constructing a new, green economy. The immediate challenge is to coordinate public infrastructure spending at the community level with medium and long-term infrastructure projects at the regional level in order to attract further private sector investment.

#### **7.2 The Renewable Energy Market**

Although Australia has been a world leader in the development of renewable energy technologies, this has not been associated with sufficient public and private investment to result in a significant proportion of energy being generated from renewable sources. As a result, only 3 per cent of Australia's energy is supplied from renewable resources (mostly hydro). However, the switch to renewable energy will result in an increased number of jobs. The challenge for the Illawarra is to ensure the region benefits from this transition.

The two main influences on the effectiveness of renewable energy and energy efficiency to deliver employment and environmental benefits to the Illawarra are investment in domestic renewable energy infrastructure and the NSW regulatory framework encouraging renewable power generation.

An audit of regional renewable energy manufacturing and generation capacity that was carried out for this report showed that there is significant scope for future investment, provided certain policy and regulatory preconditions are met.

#### **7.3 The Regulatory and Policy Environment and 2009 Budget**

The main Commonwealth renewable energy legislation is the Renewable Energy (Electricity) Act 2000, which enacts the Renewable Energy Target. The 20 per cent target now requires the amount of electricity to be generated from renewable sources to increase more than three times, from 12,500 GWh in 2010 to 45,000 GWh in 2020. In NSW a net feed in tariff of 60c a kW/h for smaller-scale renewable energy systems comes into operation from January 2010. While this is a positive measure, it should also be noted that extensive overseas experience has shown that the single most effective measure to promote renewable energy investment is a gross feed in tariff.

The 2009 Commonwealth Budget contained a wide range of new programs to encourage increased renewable energy investment with \$1.45 billion allocated to the development of clean energy technology. Current Commonwealth programs include:

- **Solar Flagships** – a new program comprising \$1.365 billion of new funding and \$425 million of existing funding over 6 years for the construction of four solar PV and solar thermal power stations;
- The establishment of the **Australian Centre for Renewable Energy**, to promote the development, commercialisation and deployment of renewable technologies;
- **Climate Ready Program** which provides competitive grants from \$50,000 to \$5 million on a matching funding basis to support R&D, proof of concept and early-stage commercialisation activities to develop solutions to climate change;
- **Renewable Energy Demonstration Program** \$435 million;
- **Energy Innovation Fund** \$150 million.

The NSW Government is also delivering many initiatives that will assist the creation of new jobs in the Illawarra. These include:

- \$100 million **Residential Rebate Program** to provide rebates to households to help make their homes more water and energy efficient.
- \$40 million **Renewable Energy Development Program** to support the commercialisation of proven renewable energy technologies
- \$30 million **Public Facilities Program** for projects which demonstrate how energy and water savings can work in practice in public or educational facilities
- \$30 million **Green Business Program** to help business save water and energy in their operations
- \$20 million **Schools Energy Efficiency Program** to upgrade lighting and implement student-based energy efficiency projects
- \$20 million **Rainwater Tanks in Schools Program** to install rainwater tanks and implement a water retrofit program in Government schools

In the energy efficiency area, the 2009 Budget National Energy Efficiency Initiative provides for a \$100 million grant to create an energy network demonstration project leading to an integrated system of renewable energy, Smart Grid and Smart Meter technology and infrastructure in one Australian city, town or region.

#### **7.4 Energy Efficiency, Broadband and the Smart Grid**

The Smart Grid proposal promises to deliver substantial employment and environmental benefits. Combined with the National Broadband Network rollout, trialing these two new infrastructure projects in the Illawarra could provide the region with an immediate, significant boost in the number of green jobs.

Smart Grid technology uses sensors to monitor electricity supply across distribution networks using communications networks such as broadband technology. Smart Grids help to integrate renewable energy like solar and wind power into the grid, and enable energy generated in homes, schools and businesses to be distributed. Combined with Smart Meters in homes, this technology will allow consumers to access immediate information on how much energy they are using, at what cost, and how they can save money. It will also allow for more efficient and reliable network operation.



Funding will be provided to a consortium of state and local government, public and private energy companies, and other private sector investors for the large scale demonstration of integrated Smart Grid technologies to approximately 25,000 households.

### **The National Broadband Network (NBN)**

An important element of the Smart Grid demonstration project is the potential link with the National Broadband Network (NBN). The NBN is a \$43 billion program aimed at delivering superfast broadband to Australian homes and workplaces. It is expected to take eight years to complete. Tasmania has been selected as the launch state for the NBN, but the Department of Broadband, Communications and the Digital Economy (DBCDE) is currently deliberating on a pilot site for the mainland. Wollongong has a strong claim to be considered as a pilot site for the rollout of the NBN. The city lacks the benefits of cable internet like Australia's capital cities, yet has some fibre to the home installed. In the region there is reasonable coverage of ADSL and ADSL2+ providing broadband speeds of about 15 per cent of that proposed as a minimum by the NBN.

Smart Metering could be supported now via cellular services. However, the NBN provides a platform over the top of which many new services and capabilities, such as the Smart Grid, with the potential to create 17,600 jobs, can be built.<sup>17</sup> In the Illawarra, the installation of the NBN and Smart Grid could be done simultaneously by workers who also have the skills to replace the old fixed meters with Smart Meters.

With a population of 64,322, Shellharbour is a regional LGA with a profile which closely fits the population criteria (65,000) for the trial. A high proportion of the Shellharbour population is socially disadvantaged and would fall within the group which must be targeted to benefit most from energy efficiency savings. Shellharbour has a comparatively high level of new home building activity. A dual Smart Grid and Broadband rollout in Shellharbour would take advantage of the efficiency and environmental benefits to be gained from incorporating the technology during new home construction.

### **7.5 Environmental Restoration**

The main barrier to increased opportunities for environmental restoration workers is the lack of ongoing funding for projects. For example, the maintenance of a Regional Bushland data base to provide essential biodiversity mapping information is unfunded. Projects overwhelmingly depend on one off grants which cannot provide a future for land stewardship. With sufficient ongoing public investment, environmental restoration activities have the potential for significant job creation.

### **7.6 Solar Industry**

Although the Australian solar PV industry employs less than 4,000 people, it is estimated that there is potential for the creation of 20,000 installation jobs. The NSW Solar Feed-in-Tariff Report to Ministers made reference to 33 installation jobs created per MW of solar

PV installed. The solar hot water systems, thermoelectric solar energy systems and solar cell production control systems already being manufactured in the Illawarra provide the basis for the expansion of solar related jobs in the region.

Central to the analysis in this report is the contention that the role of Illawarra manufacturing in both the solar and other green industries may, initially at least, be targeted at segments of the production process where the region has an existing competitive advantage. For example, the region's steel production capacity has the ability to put the region in the forefront of steel component manufacturing in solar thermal and other applications.

### **7.7 R&D and Sustainable Manufacturing**

Regional economic development is strengthened when strong technical links and knowledge flows exist between universities and local businesses, producing a 'creative milieu' which fosters local innovation, production, employment and exports. The University of Wollongong has already established strong links with local businesses involving student research and work experience through the student problem solving team projects, internships and numerous ad hoc arrangements. These could be readily extended to incorporate a distinct sustainable stream.

If local firms are to move into sustainable product areas they will need advice regarding both the technical production requirements and the market viability of such options, as well as a capacity to scan research activity at a local, national and international level for appropriate products.

Smaller firms do not have the resources to undertake significant basic research and much of the knowledge they require is not 'innovative' in a research sense, but rather involves the adaptation of existing knowledge to new situations. A small business advisory service supported by the University, but based off campus, for example at Futureworld, could provide this type of 'community brokerage' service at a limited cost per consultation. A model has been developed through the Sydney Business School at the University of Wollongong. The key to making this type of service effective is to identify the 'right' people to develop the business who understand the constraints of both the University and small business environments. The Innovation Campus has space for innovative workshops in the light industrial zone on Montague Street. This approach has the support of a number of academics and business organisations.

## **8. TRANSFORMING THE ILLAWARRA: CONCLUSION AND RECOMMENDATIONS**

All of the renewable energy technologies that will power the future rely on steel. Steel manufacturing relies on coking (metallurgical) coal. Australia is the world's largest producer of coking coal with 53 per cent of the export market. In 2007, Australia exported 132mt of coking coal while the other four major producing countries, Indonesia, the United States, Canada and Russia, between them exported 102.3mt, and no other country exports more than 4mt.<sup>18</sup>

The Illawarra's Southern coalfield is the only source of premium quality hard coking coal in NSW.<sup>19</sup> This ensures that Australia's steel industry is world competitive in blast furnace efficiency.<sup>20</sup> It is this level of efficiency that makes Australia's largest steel producer, BlueScope Steel, world competitive – able to export 50 per cent of its steel production.

The comparative advantage of the Illawarra in providing renewable energy and green industry infrastructure is similar to that which Australia had in solar power development in the 1970's. The choice for policy makers is to exploit this advantage, service the domestic market and open up export opportunities, or, instead, rely on imports.

The transformation of the Illawarra, however, will not happen automatically. It will come from ensuring that public infrastructure expenditure is directly linked to green job-creation. The Commonwealth's \$21.3 billion infrastructure spending on schools and community housing and the \$650 million Jobs Fund are examples of government funding that provide the opportunity for the integration of research and development, planning, training, and skills acquisition that are necessary for a successful transformation of the region's economy. So too, is the funding allocated in the NSW budget for building projects in each electorate, the Illawarra Advantage Fund, the \$250m energy efficiency and residential rebate programs and recurrent spending on hospitals, schools and community projects.

Finally, it should be noted that the Green Jobs Illawarra (GJI) project owes much to the commitment and cooperation of the region's major institutional stakeholders represented on the Project Steering Committee. Their belief in the potential of the region in which they live and work has been crucial to the success of GJI. So also, has been the support of the Illawarra community which now has before it a practical vision for the future. The store of goodwill that has been built up during the short time of this project is ready to be harnessed for the region's advantage as the first phase of the GJI project comes to an end. The transformation of the Illawarra can, and should, begin immediately.

## **RECOMMENDATIONS**

### **Recommendation 1: Green Street Project**

*The purchase of a 'street' of 8-10 building lots in the Illawarra to enable the construction of display homes that utilise a diverse range of available and experimental technologies to meet or exceed a range of sustainability criteria including:*

- *6 star energy efficiency building rating*
- *Harvesting and conservation of water to meet 100% of household requirements*
- *Domestic power generation to meet 100% of net household power requirements*

*This project could be undertaken either through the purchase of privately owned land or through Landcom's existing stock with the costs of land acquisition and construction to be recouped through the sale of the properties at the end of the display period. It is anticipated that this project would enable the participation of apprentices in the building trades, developing and demonstrating green skills. Additionally, this project would provide an opportunity to monitor and document social behaviour in relation to energy efficiency and general sustainability principles.*

*The Green Street concept could also be applied to a retrofitting project for the social housing sector. Maintenance, repair, and upgrading of social housing units are part of an ongoing program faced with the difficult problem of energy efficient expenditure reducing the overall level of maintenance provision. Funding structural refurbishment in the social housing sector embracing solar roof panels, solar hot water units, rainwater collection, and grey water recycling would complement the Green Street proposal.*

### **Recommendation 2: Iconic Public Buildings – Major Retro-Fit Project**

*The scoping and establishment of retrofit projects focusing on iconic public buildings in the region such as a Town Hall or a major civic building to showcase the use of renewable energy technology and sustainable construction.*

### **Recommendation 3: Wind Power Industry Development Strategy**

*Implementation of the NSW Government's renewable precincts strategic plan for the development of the wind power generation industry in the Illawarra to include the consideration of the current proposals developed by the Southern Councils Group focussing on 'community wind power generation'.*

### **Recommendation 4: Wave Power Technology– Centre of Excellence**

*Positioning the Illawarra as a 'centre of excellence' for wave power generation technologies by harnessing the existing R&D capacity of the University of Wollongong, the innovative manufacturing and engineering capacity of regional firms and by supporting cutting edge projects by international market leaders in this field, including Oceanlinx.*

**Recommendation 5: Port Kembla Steelworks Cogeneration Project**

*The facilitation of urgent discussions between the Commonwealth and NSW Governments, the steel industry and regional stakeholders to reach agreement on addressing and removing the outstanding barriers to the construction of the \$1 billion cogeneration facility at the Port Kembla Steelworks. This initiative would represent the largest carbon abatement project in the nation, equivalent to 1 million tons of green house gasses and directly creating an estimated 2 thousand construction jobs in the region.*

**Recommendation 6: Smart Grid Regional Trial and Broadband Rollout**

*The preparation, in consultation with Illawarra Local Government Councils, of a joint submission proposing the region as a location for the anticipated national Smart Grid demonstration project, and the initial mainland location for the upcoming National Broadband Network (NBN) rollout.*

**Recommendation 7: Illawarra Jobseekers and Government Funded Programs**

*A new pathway be developed for the referral of registered job seekers from Commonwealth employment agencies to training providers such as TAFE Illawarra, for short courses in suitable areas where there are demonstrated or projected labour shortages such as Insulation Installers in order to maximise employment opportunities that are created by current government funded programs.*

**Recommendation 8: Green Corp Illawarra**

*Initiatives recommended in this report should provide the basis for opportunities to train and employ job seekers in the region as part of an articulated strategy. Projects should be developed in consultation with regional training and employment stakeholders to be funded by the Commonwealth Government's recently announced Green Corp Program.*

**Recommendation 9: Transforming Manufacturing and Engineering Industry**

*Investigate funding sources to enable an assessment of green technology opportunities for manufacturing and engineering industries in the region. This assessment would include an analysis of each technology to identify market gaps and the capacity of local companies to take advantage of the opportunities.*

**Recommendation 10: Green Technology Innovation Advisory Service**

*Establish a Green Technology Innovation Advisory Service for small and medium sized firms in the Illawarra, linking local firms to University of Wollongong expertise. This service would be complementary to existing Commonwealth Government and University of Wollongong innovation initiatives.*

### **Recommendation 11: University of Wollongong - Teaching and Training Capacities**

*The University consider further developing its role as a trainer of professionals in all facets of sustainable industry including consultants and advisers on energy efficient products and new materials and government environmental policies. The University's role may be enhanced by developing the following options:*

- *Investigate the need for multi-disciplinary degrees and post-graduate research projects to further develop sustainable products.*
- *Investigate opportunities to develop relevant multidisciplinary training programs (eg, professional development short courses in conjunction with TAFE Illawarra)*
- *Develop a Solar [or Renewable] Decathlon event in conjunction with 'Green Street' or similar project.*
- *Sponsor a business planning competition in conjunction with the existing Trail-Blazer program to encourage new innovation and start ups in 'green' businesses.*

### **Recommendation 12: Professional Development Short Courses**

*Specialised courses for local manufacturing organisations be offered, promoted and developed by TAFE as a matter of urgency in order to improve the overall resource and cost efficiency of production operations and improve their capacities to manufacture new environmental products in line with the objectives of the Manufacturing Skills Industry Council. These specialised courses should include training for employers and employees in sustainable workplace auditing.*

*While the inclusion of sustainability units in TAFE Illawarra training courses will lead to a general upgrading of skills in the regional workforce, it will take some time before this knowledge becomes commonplace in the majority of local businesses. Thus, the immediate priority is to provide additional short courses to increase sustainability skills and knowledge in the existing workforce, focussing on the major concentrations of regional employment. A number of these courses have already been developed.*

### **Recommendation 13: Green Technology Demonstration Spaces**

*Demonstration facilities for sustainable residential innovations including prototypes of household level devices be provided, in conjunction with 'Green Street,' as part of a student eco-housing competition, and/or in conjunction with TAFE Illawarra sustainable building training facilities. This will address the limited local opportunities that currently exist to develop prototypes of household level devices and to demonstrate them to potential commercial partners.*

*It is further recommended that a process of evaluation and improvement be included in sustainable housing options increasing the exposure and engagement of the community and local businesses to potential commercial partners.*

**Recommendation 14: Sustainable Construction and Training Partnerships**

*Partnerships be developed between NSW TAFE – Illawarra Institute and regional stakeholders to undertake sustainable building projects designed and constructed to teach sustainable building skills, and then used by the contracting party in situ, where it may also be possible to monitor and evaluate innovations included in those buildings.*

*TAFE Illawarra currently has contracts to build demountable cabins for local governments. These provide three work teams of 18 pre-apprentices with training for the first two stages of an apprenticeship, which greatly enhances their employability. On completion the buildings are taken by the contractor organisation while the students usually find employment with builders to complete their apprenticeship. With suitable sponsorship, this program could be used to teach and demonstrate sustainable building skills.*

*Options include:*

- *Planned Local Government holiday cabin construction projects*
- *A small project team be set up between TAFE Illawarra and the University of Wollongong to design a building to be used to both teach sustainable construction skills and act as a public demonstration site for commercial builders and to showcase new residential sustainable technologies and emerging innovations.*

**Recommendation 15: Aquaculture Research and Application**

*Further consideration be given to the research and development of aquaculture technology such as the current project being developed in the Shoalhaven. These projects require skills, training and technical support from TAFE Illawarra and the University of Wollongong, the development of viable business plans and ‘seed’ funding to support the first stages of their operation.*

**Recommendation 16: Carbon Foot-Print Software**

*The University of Wollongong investigate the feasibility of establishing a business consulting facility through its Carbon Central Computing Institute (CCCI) linked to existing local ‘footprinting’ consulting companies to commercialise its business solutions software capabilities.*

**Recommendation 17: Green Jobs and the Aboriginal Community**

*The expansion and enhancement of Bushcare and Landcare type initiatives in consultation with the Aboriginal communities of the region focussing on increased Indigenous enterprise formation and employment in green jobs. This should include enhanced support for the delivery of business and project planning as well as ‘on the job’ accredited training, technical research and support services.*

**Recommendation 18: Community Engagement in Sustainability Initiatives**

*The NSW and Local Governments to support the establishment of ‘neighbourhood climate change/sustainability groups’ in each of the region’s five local government areas. These groups would promote and encourage community action for adopting sustainable practices at the household and neighbourhood level. Schools and other community groups would be particularly encouraged to participate and play a leading role. This recognises that sustainability practices, including reducing energy consumption, is not just a matter for regulation by governments - households must also be encouraged to be a part of the solution.*

**Recommendation 19: Advancing Green Jobs Illawarra**

*It is recommended that the Green Jobs Illawarra Project Steering Committee, be expanded to include additional community representatives and continue as a discrete task focussed project group of an appropriate regional organisation such as the newly established Regional Development Australia – Illawarra. It is further recommended that the Project Steering Committee be provided with adequate resources including funding for a project co-ordinator for an initial 3 year period to enable the implementation of the Green Jobs Illawarra Action Plan and the development of a longer term blueprint for regional transformation.*

*The immediate role of the Green Jobs Illawarra Steering Committee and its Project Coordinator would be to oversee the implementation of key recommendations of this report such as the Green Street and iconic buildings retrofit projects and to organise a major conference in the Illawarra on the theme of Green Jobs. The Steering Committee would also be charged with developing medium and longer term strategies for the sustainable transformation of the region's industries such as financing options for major renewable energy and other regional green jobs projects and infrastructure requirements for a transformation to a green economy including:*

- *Early access to National Broadband Network and smart grid (energy) initiatives.*
- *Integrated passenger transport systems and freight transport opportunities*
- *Incorporating green jobs initiatives and strategies into the existing major strategic plans for the Illawarra such as the Illawarra Regional Strategy and the State Plan as well as the strategic directions for the new RDA Illawarra.*
- *The identification of and planning for renewable energy precincts in the Illawarra.*



**Recommendation 20: Green Skills and Training - \$150,000 Allocation**

*It is recommended that the \$150,000 funding commitment for green skills and training be utilised for the following employer/employee short courses to be provided by TAFE Illawarra:*

<b>Suggested Programs</b>	<b>Course duration</b>	<b>Cost per course per person</b>	<b>Minimum number of participants per course</b>	<b>Number of Courses to be offered by 30 June 2010</b>	<b>Total</b>
Participate in Environmentally Sustainable Work Practices	1 day	\$200	Ten	20	\$40,000
Statement of Attainment in Policies, Procedures & Practices for Sustainability	7 days	\$1200	Ten	1	\$12,000
Environmental Sustainability in the Workplace	1 day	\$200	Ten	15	\$30,000
Saving Energy in the Workplace	1 day	\$200	Ten	20	\$40,000
Home Sustainability Assessment	4 days	\$700	Ten	3	\$21,000
<b>TOTAL</b>					<b>\$143,000</b>

*These courses will complement the findings and recommendations in this report in relation to skills and training from the Green Street Project through to Green Corps Illawarra.*

### (iii) REFERENCES

- 1 A Statistical Guide to the Illawarra Region 2009. (Illawarra Regional Information Service, IRIS, North Wollongong, July 2009). ABS- National Regional Profiles, Estimated Population, Census 2006.
- 2 Ibid.
- 3 IRIS. 2005/06 Estimates. Illawarra Gross Regional Product (GRP). ABS Labour Force Statistics, Census 2006. Comparison with NSW and Australian economies. Manufacturing as a percentage of Illawarra GRP, 18.9%, NSW GSP, 11.1%, Australian GDP, 11.0%.
- 4 ABS Labour Force Statistics. Brett Cox, 'Report cites 15% jobless rate' The Illawarra Mercury, 11 July 2009.
- 5 Morrissey et al, Immigration and Industry Restructuring in the Illawarra. (AGPS, Canberra, 1992) pp. xi, 45.
- 6 IRIS Labour Force Statistics by Region, Age, Sex. 1992-2009. ABS- Labour Force, Australia. Detailed. See also, Brett Cox 'Golden Jobs a cruel mirage for youth' The Illawarra Mercury, 17 July 2009.
- 7 IRIS Statistical Guide, op. cit. Illawarra Business Counts. Manufacturing. Illawarra LGA. June 2006. ABS – Australian Business Register, Counts of Australian Business Numbers: Single Location Business. Brett Cox, 'New orders may point to blast restart' The Illawarra Mercury, 4 July 2009.
- 8 Alex Macdonald, 'Chinese demand holds up steel prices,' The Australian, 7 July 2009.
- 9 Green Gold Rush, ACTU/ACF. October 2008. p. 19.
- 10 See Chris Herde, 'Wind holds promise of work for thousands,' The Australian, 18 June 2009.
- 11 The Illawarra Mercury, 3 August, 2009.
- 12 See, A Sustainable Agricultural Landscape for the South Coast of NSW. Report prepared for the Southern Councils Group, February 2004.
- 13 See <http://www.sustainableillawarra.com.au>
- 14 CSIRO (2008), Growing the Green Collar Economy: Skills and labour challenges in reducing our greenhouse emissions and national environmental footprint. Report to the Dusseldorp Skills Forum, by Dr. Steve Hatfield-Dodds, Dr. Graham Turner, Dr. Heinz Schandle and Tanjua Doss. June.
- 15 NSW Department of Education and Training (2008), NSW Green Skills Strategy Implementation Plan, 2008-2010, State Training Services.
- 16 Industry Skills Council (2009), Environmental Sustainability: An Industry Response p. 23.
- 17 Access Economics, evaluation of Smart Grid, 27 May, 2009.
- 18 International Energy Agency (2008) Coal Information 2008, Paris, p.1.20
- 19 NSW Department of Primary Industries (2009) New South Wales Coal Industry Profile, p. 37
- 20 The world average blast furnace efficiency is 550kg/t (coal use per ton of hot metal production). In Australia it is 500kg/t. See International Energy Agency, 'Tracking Industrial Energy Efficiency and CO2 Emissions,' 2007.

#### **(iv) BIBLIOGRAPHY**

Australian Bureau of Statistics:

- Australian Business Register Counts of Australian Business Numbers: Single Location Business. Illawarra Business Counts
- ABS Census 2006
- Labour Force Statistics, 1991-2009
- National Regional Profiles, Estimated Population, Census 2006
- Labour Force Statistics, Census 2006. IRIS- Illawarra Gross Regional Product (GRP) 2005/06 Estimates. Comparison with NSW and Australian economies. Manufacturing as a percentage of Illawarra GRP, NSW GSP, Australian GDP.

ABC International Radio Australia. 19 November, 2008

<http://www.radioaustralia.net.au/programguide/stories/200811/s2423656.htm> (Accessed 14 July 2009)

Access Economics Report for Clean Energy Council, The net employment impacts of climate change policies, 3 June 2009.

Australian PV Association, US New Energy for America Plan,

<http://www.apva.org.au/drupal-6.3>. (Accessed 10 July 2009)

Australian Conservation Foundation and Australian Council of Trade Unions (2008), Green Gold Rush, October.

Bento Strategy (2009), Superconductor Market Research, HTS in 2009, 2 June

BlueScope Water, BlueScope Water Capabilities for Stormwater Harvesting and Reuse Projects, Effective Infrastructure, May 2009.

Clean Energy Council Budget Briefing,

<http://www.cleanenergycouncil.org.au/news/showarticle.ph?id=188> (Accessed 24 June 2009)

Clean Energy Council and Renewable Energy & Energy Efficiency Partnership, Regional Export Opportunities for Australia's Clean Energy Industry, June 2008. Australian Government, Austrade.

The Climate Institute (2009), Clean Energy Jobs and Investment in Regional Australia, Briefing, May, [www.climateinstitute.org.au](http://www.climateinstitute.org.au)

Commonwealth of Australia, Wilkins Review, Strategic Review of the Australian Government Climate Change Programs, July 2008.

Connection Research (2009), Who are the Green Collar Workers? A Definition and Taxonomy. Report prepared by Connection Research in Conjunction with the Department of Environment and Climate Change NSW and the Environmental Institute of Australian and New Zealand, Sydney, NSW.

CSIRO (2008), Growing the Green Collar Economy: Skills and labour challenges in reducing our greenhouse emissions and national environmental footprint. Report to the Dusseldorp Skills Forum, by Dr. Steve Hatfield-Dodds, Dr. Graham Turner, Dr. Heinz Schandle and Tanjua Doss. June.

Docking A, Mason A, Knowd I, Urban Agriculture: The New Frontier, paper presented to Planning for Food Seminar. Vancouver, 21 June, 2006.

Donaldson, M., et al., (2009), Power to the People, Building Sustainable Jobs in the Illawarra, A Report to the South Coast Labour Council, March, University of Wollongong.

Environment Victoria, Victoria, The Green Jobs State: Seizing the Opportunities, 2009.

Farmers Markets <http://www.farmersmarkets.org.au> (accessed 4 August 2009)

Futureworld Eco-Technology Centre (2009), ETEC: Futureworld Eco-Technology Exhibition Centre, <http://www.futureworld.org.au/projects/etec.htm> (accessed 28 May, 2009)

Illawarra Regional Information Service, (IRIS) North Wollongong, July 2009  
A Statistical Guide to the Illawarra Region 2009. <http://www.iris.org.au> (accessed 4 August 2009)

Illawarra Transport Taskforce, The T- Team, Moving Together – A Transport Strategy for Kiama, Shellharbour and Wollongong, 2004.

Kernot C, 'A Quite Revolution', Griffith Review, Edition 24, 2009.  
Industry Skills Council (undated), Environmental Sustainability: An Industry Response.

Manufacturing Skills Australia (2008), Sustainable Manufacturing, Manufacturing for Sustainability, October.

McLennan Magasanik Associates, Report to Department of Climate Change, Benefits and Costs of the Expanded Renewable Energy Target, January 2009.  
- Report to the Climate Institute, Regional Employment and Income Opportunities Provided by Renewable Energy Generation, May 2009.

Morrissey, M., et al, Immigration and Industry Restructuring in the Illawarra. AGPS, Canberra, 1992.

NSW Department of Education and Training (2008), NSW Green Skills Strategy Implementation Plan 2008-2010, State Training Services.  
- Skills for Sustainability, 2<sup>nd</sup> Edition, February, 2009.

NSW Solar Feed-in Tariff Taskforce, Report to Ministers, February 2009.  
Office of the Renewable Energy Regulator <http://www.ober.gov.au/publications/media-release/mr38jan09.html> (accessed 20 July 2009).

Rankin, K. (2009), TAFE NSW Delivering Green Skills, Presentation to the TAFE NSW Managers Association, Kathy Rankin, General Manager, Training and Educational Support, April.

Spierings J, Dusseldorp Skills Foundation, April 2008,  
<http://www.dsf.org.au/resources/detail/?=104> (accessed 20 July 2009).

Smart Grid, Smart Broadband, Smart Infrastructure, Melding Federal Stimulus Programs to Ensure More Bang for the Buck, [http://www.americanprogress.org/issues/2009/04smart\\_infrastructure.html](http://www.americanprogress.org/issues/2009/04smart_infrastructure.html) (accessed 10 August 2009)

Sorensen B, '2004: an energy storage tale', Renewable Energy Focus, May/June 2009.

Southern Councils Group, Wind Power Concept Study Report, August 2009.

Sydney Food Fairness <http://sydneyfoodfairness.org.au> (accessed 4 August 2009)

TAFE NSW (undated) Green Skills TAFE NSW Brochure.  
- 2009, Green Skills Strategy Progress Report, Educational Futures Forum, 27 May.

United Nations Environment Program, Background Paper on Green Jobs, UNEP 2008

University of Wollongong (2009), Federal funding for new research centre, Campus News, Issue 2, Volume 12, July.  
-Contact List/Researchers/Members,  
<http://research.uow.edu.au/energyfutures/researchers/index.html> (accessed 28 May 2009)  
- Research Strengths 2007-2009, <http://www.edu.au/research/strengths/index.html> (accessed 30 May 2009)  
- School of Earth and Environmental Sciences, Environmental Science,  
<http://www.uow.edu.au/science/eesc/envsci/index.html> (accessed 28 May 2009)

United Nations Environment Program, Background Paper on Green Jobs, UNEP 2008.

Watt M, Passey R, Watt G, 'Designing a Coherent PV Strategy for Australia', paper presented to ISES-AP 3<sup>rd</sup> International Solar Energy Society Conference- Asia Pacific Region (ISES-AP-08) Incorporating the 46<sup>th</sup> ANZES Conference 25-28 November 2008, Sydney Convention and Exhibition Centre.

## **(v) Acknowledgments**

The Project Steering Committee and the Project Officers, extend their thanks to all of those in the Illawarra community who participated in the preparation of this report. In particular, we would like to thank Pat Mowbray and the staff and supporters of Futureworld, Hana Singleton from IRIS, the attendees at the Community Forum held on 16 July 2009. We would also thank the following participants in the Renewable Energy Forum held on 28 July 2009 and Stuart Waters from Twyford Consulting for his generous assistance at that event:

**Dennis Paterson**, Chromax Hardchrome  
**Anthony Barthelmess**, Cardno Forbes Rigby  
**Michael Bowditch**, ABB Port Kembla  
**Rod Brown**, Ringway Control & Automation  
**Richard Bufill**, ICN NSW  
**Ian Chew**, David Brown Gears  
**Brendon Cohen**, Chromax/Prokote  
**Bob Coombes**, Futureworld  
**Paul Cooper**, University of Wollongong  
**Troy Coyle**, University of Wollongong  
**Roly Dixon**, Private Parts Engineering  
**Mark Glover**, Eco Waste Pty., Ltd.  
**John Grace**, RDA Illawarra  
**Tony Green**, DSRD  
**Leanne Grogan**, AIG  
**Sandy Haig**, i3net  
**John Higgins**, Partech Systems Pty., Ltd.  
**Rowan Huxtable**, Wollongong Climate Action Network  
**John Keegan**, Enterprise Connect  
**Peter Kilmurray**, David Brown Gears  
**Ian King**, HATCH  
**Rhonda Lawrie**, DSRD  
**Miles Lochhead**, Wingecarribee Shire Council  
**Ken Long**, Enterprise Connect  
**Nigel McKinnon**, DSRD  
**Lisa Miller**, University of Wollongong  
**Michelle Miran**, Partech Systems Pty., Ltd.  
**Pat Mowbray**, Futureworld  
**David Officer**, University of Wollongong  
**Dennis Olmstead**, University of Ballarat  
**Craig Peden**, University of Ballarat  
**Judy Raper**, University of Wollongong  
**Mark Roberts**, DPC  
**Jane Robinson**, DEEWR  
**Steve Sanders**, AusIndustry  
**Carmelo San Gil**, BlueScope

**Colin Seaborn**, SOS Initiatives Pty., Ltd.  
**Babak Seyedan**, HATCH  
**Phillip Wharrie**, Worley Parsons  
**Stuart Weylandsmith**, Oceanlinx  
**Ben van der Wijngaart**, Southern Councils Group  
**Bradley Wheaton**, National Biofuels Group  
**Simon Wallace-Pannell**, Business Treading Lightly

**(vi) Consultation List**

The following industrialists, University of Wollongong academics, government department officers and community representatives were interviewed for this report:

**Dr Michael Adams**, Woolyungah Aboriginal Centre  
**Peter Batten**, NSW Department of Education and Training  
**Beverly Bloomfield**, Inter Global Solutions Pty Ltd, Shoalhaven Chamber of Commerce  
**Jenny Briscoe-Hough**, Co-ordinator Port Kembla Community Project  
**Richard Bufill**, Industry Capability Network, NSW  
**Marty Burgess**, TAFE NSW - Illawarra Institute  
**A/ Professor Andrej Calka**, Faculty of Engineering  
**Professor Chris Cook**, Faculty of Commerce  
**A/Professor Paul Cooper**, Faculty of Engineering  
**Dr. Corinne Cortese**, Faculty of Commerce  
**Ian Chew**, General Manager, David Brown Gears  
**Ken Davies**, Southern Rivers Catchment Management Authority  
**Elizabeth Dixon**, Senior Environmental Officer, Shoalhaven City Council  
**Professor Sara Dolnicar**, Faculty of Commerce  
**Professor Shixue Dou**, Institute of Superconducting and Electronic Materials  
**Stephen Driscoll**, Director, Sustainability and Policy, Landcom  
**Geoff Dyer**, Worley Parsons  
**David Fuller**, Innovation Campus  
**Dr Chris Gibson**, Faculty of Science  
**Carmelo San Gil**, National Business Manager, BlueScope Building Solutions  
**A/Professor Nick Gill**, Faculty of Science  
**Professor Aditya Ghose**, Faculty of Informatics  
**Professor David Griffith**, Faculty of Science  
**A/Professor Helen Hasan**, Faculty of Commerce  
**Michael Hough**, Sydney Business School, Wollongong  
**Professor Buddhima Indraratna**, Faculty of Engineering  
**I3net**, Illawarra Innovative Industries Network  
**A/Professor Peter Kell**, Faculty of Education  
**Peter J. Kilmurray**, David Brown Gears  
**Stephen King**, Housing NSW  
**Dr Kosta Konstantinov**, Institute for Superconducting and Electronic Materials  
**Dr Buyung Kosasih**, Faculty of Engineering  
**Clare Larkin**, Housing Industry Association

**Professor Shirley Leitch**, Faculty of Commerce  
**Rob Long**, NSW TAFE – Illawarra Institute  
**Rory Macalister**, Department of State and Regional Development, Nowra  
**Pat Mowbray**, Futureworld  
**Professor Tim McCarthy**, Faculty of Engineering  
**Dr Brian Monaghan**, Faculty of Engineering  
**Professor John Morrison**, Faculty of Science  
**Angus Nardi**, Property Council of Australia  
**Darren O’Connell**, NSW TAFE – Illawarra Institute  
**Professor David Officer**, Intelligent Polymers Research Institute  
**A/Professor Sarath Perera**, Faculty of Engineering  
**Neville Richardson**, Miltonbrook Pty., Ltd  
**Jane Robinson**, Commonwealth Employment Co-ordinator  
**A/Professor Muttucumaru Sivakumar**, Faculty of Engineering  
**Professor Trevor Spedding**, Faculty of Commerce  
**Professor Gordon Wallace**, Intelligent Polymers Research Institute  
**Phillip Warrie**, Worley Parsons  
**Stuart Weylandsmith**, Oceanlinx  
**Pia Windberg**, Shoalhaven Marine and Freshwater Centre  
**Graham Wolfe**, Executive Director, NSW Housing Industry Association  
**Richard Wood**, Development Director, Landcom  
**Professor Shu Qing Yang**, Faculty of Engineering  
**Max Zalacos**, Sustaining Our Shoalhaven House Project  
**Tina Zalacos**, Sustaining Our Shoalhaven House Project