



Energy Efficiency in Commercial and Residential Buildings:

Jobs and Skills Implications





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Skills Australia ▶ **May 2011**

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Contents

Acknowledgements	iii
Executive Summary	1
Key findings.....	1
Workforce planning.....	2
Addressing skills needs in identified occupations.....	3
Regulation and accreditation.....	3
Pathways.....	4
Implications for the education and training sector.....	4
Developing business skills.....	5
Introduction	7
Methodology	9
1. Findings	10
1.1 Key drivers.....	10
1.2 The commercial building sector and its occupations.....	11
1.3 The residential building sector and its occupations.....	14
1.4 Emerging occupations.....	18
1.5 Upskilling requirements.....	19
1.6 Anticipated skills shortages.....	23
1.7 Regulation and accreditation.....	24
1.8 Skills implications of emerging technologies and services.....	25
2. Discussion and Recommendations	26
2.1 Workforce planning.....	26
2.1.1 Short, medium and long-term outlooks.....	26
2.1.2 Apprenticeships.....	27
2.1.3 Workforce development.....	28
2.2 Coordinating approaches to policy development across jurisdictions and stakeholders.....	29
2.3 Addressing skills needs in identified occupations.....	30
2.4 Regulation and Accreditation.....	33
2.5 Pathways.....	35
2.6 Implications for the Education and Training Sector.....	36
2.6.1 Short courses in higher education and VET.....	38
2.6.2 The Vocational Education and Training (VET) sector.....	38
2.6.3 Higher Education (HE).....	39
2.7 Developing Business Skills.....	41



Appendix A. Interview questions	43
Appendix B. Key initiatives targeting energy efficiency	44
Appendix C. Workforce development activities in energy efficiency in Australia: some examples	53
Appendix D. Occupational case studies	55
Appendix E. Recommendations	61
Appendix F. List of acronyms	62



Executive Summary

Energy efficiency initiatives across Australia are affecting existing occupations, requiring additional skills for new ways of doing things. Some new occupations are also being created, but on a much smaller scale.

Skills Australia has explored the impact of energy efficiency initiatives in the commercial and residential building sectors on skills and jobs. Buildings make a substantial contribution to Australia's emissions, and energy efficiency strategies are seen as a highly effective way of reducing them.

Using qualitative research methods, Skills Australia has captured the insights of industry, government, professionals and Industry Skills Councils through in-depth interviews.¹ The research also considered impacts of new and emerging technologies for energy efficiency.

Key findings

While a few new occupations have resulted from energy efficiency initiatives for the built environment, the demand for new skills within existing occupations is more significant. Electricians and instrumentation electricians, plumbers, facilities managers, building scientists, and several occupations in energy assessment all require new skills. Skills implications for retrofitting are likely to be more extensive than for new build, which represents a small proportion of all construction.

Energy efficiency initiatives call for jobs and skills in:

- auditing and reporting
- installation and maintenance of energy-efficient appliances to meet revised building standards
- assessment of new and existing buildings against rating systems
- monitoring data output from energy management systems and 'tuning' buildings for peak performance
- marketing new and existing buildings in both the commercial and residential sectors
- drawing up 'green leases'.

The individuals and organisations interviewed by Skills Australia saw state and federal government programs promoting energy efficiency in the built environment as key drivers of change.² For Master Builders Australia, for example, the introduction of commercial and residential Mandatory Disclosure, along with the required six-star energy rating for residential buildings, is the most significant change for the building and construction industry. More environmentally responsible consumers, and bottom-line incentives of reduced energy costs, are also driving change.

Several respondents identified emerging occupations in the area of energy monitoring and auditing for residential and commercial buildings. Among them are Home Energy Assessor and Nationwide House Energy Rating Scheme Assessor.³ Currently, vocational education and training (VET) courses in energy efficiency assessment are spread between construction and electro-technology Training Packages. This makes continuity between the roles in home, small commercial and larger commercial settings hard to achieve.⁴

We need an interdisciplinary approach to skills development. From the design stage through construction and commissioning to occupation, operation, systems monitoring and maintenance, the building process now demands new understandings in common. Architects, designers, engineers, project managers, builders, building scientists, plumbers, electricians and instrumentation electricians, real estate agents, facilities managers, lawyers and accountants could all require knowledge of energy flows and energy monitoring systems.

1 For a list of people and organisations interviewed for this research, see section on methodology below.

2 See list of programs at Appendix B.

3 See case studies of these occupations at Appendix D.

4 This is the view of Caroline Alcorso, NSW Department of Education and Communities.



Blending knowledge is a key part of up-skilling. For example, the installation of smart meters in a switchboard requires blending electrical and telecommunications knowledge, as smart meters are a telecommunication device.

In the course of the research, interviewees identified the following skills shortages:

- Assessors for Residential Building Mandatory Disclosure: Victoria has identified that 2000 assessors will be required in Victoria alone when the disclosure requirement takes effect.
- Building scientists: currently there are very few practising in Australia.
- Energy auditors.
- VET teachers.
- Refrigeration and air conditioning mechanics: there is a lack of people taking up the Certificate III.⁵

It cannot be assumed that standard training for occupations will address emerging needs.

Our respondents identified several emerging technologies likely to affect future workforce development needs. New heating, ventilation and air-conditioning technologies in residential applications, such as heat exchange ventilators, could require new skills in the future for the plumbing and electrical trades. The advent of Energy Services Companies, which provide a suite of retail services including energy advice and assessment, is also likely to impact accreditation and training.⁶

Workforce planning

As new policies and technologies drive improvements in energy efficiency, skills shortages are likely to emerge. We expect that these will be worse in the short and medium term than in the longer term to 2025, although a cost on carbon and diminishing resources such as oil could lead to acute skills shortages in the longer term.

There is a risk that the skills gaps could be filled by individuals without the necessary training to safely install energy-efficient products. The commercial and residential building sectors also face heightening competition from the resources sector for trained workers.

Respondents agreed that large-scale policy initiatives such as the National Broadband Network must consider workforce capacity and 'knock-on' effects for related occupations, as well as the effectiveness of current regulatory arrangements. A number of workforce planning activities are underway at federal and jurisdictional level.⁷

The apprenticeship system will play a key role in providing the future workforce for energy efficiency roles. Long-term workforce planning and possible government intervention is needed to fill skill gaps in areas of identified shortage. Strategies could include funding apprenticeships within energy-related trade occupations experiencing skills shortages, such as plumbers and electricians.

The National Energy Efficiency Skills Initiative is being developed as a comprehensive strategy to provide for the future skill requirements of a low-carbon economy and the implementation of sustainability strategies. Skills Australia believes the initiative should include workforce development planning in addition to training strategies, and be funded accordingly. Coordinating the initiative with the implementation of the national Green Skills Agreement is also important. The Green Skills Agreement aims to build the capacity and capability of Australia's VET sector to provide training in skills for sustainability.

Coordination and communication between stakeholders at federal and jurisdictional level, and across industries, is essential to reduce duplication of effort and enhance outcomes.

5 This appears to be related to the lack of awareness of the industry, especially among school leavers. See discussion at Section 2.6 below.

6 *Report of the Prime Minister's Task Group on Energy Efficiency* (2010), www.climatechange.gov.au/~media/submissions/pm-taskforce/report-prime-minister-task-group-energy-efficiency.ashx, accessed 10 November 2010, pp. 176–180.

7 See Appendix C for details.



Recommendation 1: Comprehensive workforce development plans be established for occupations related to energy efficiency in the built environment and initiatives coordinated and communicated across jurisdictions and stakeholders

It is recommended that under the National Strategy for Energy Efficiency, the Ministerial Council for Energy (MCE) and the Ministerial Council for Tertiary Education and Employment (MCTEE) develop comprehensive workforce planning for occupations related to energy efficiency in the built environment.⁸ This will include collecting data on identified occupations, identifying skills shortages and oversupply, and considering how to address shortages in the short, medium and long term, with both VET and the higher education sector to be included. To ensure coordination and communication of workforce development initiatives in energy efficiency across jurisdictions and key stakeholders, the working groups under the National Strategy for Energy Efficiency (the National Framework for Energy Efficiency's Trades and Professional Training and Accreditation Implementation Group, in conjunction with the Green Skills Agreement Implementation Group) should be given the mandate and resources to implement the National Energy Efficiency Skills Initiative.

Addressing skills needs in identified occupations

Skills Australia, in consultation with a variety of stakeholders, assesses occupations based on the Australian and New Zealand Standard Classification of Occupations (ANZSCO) to determine if they meet set criteria for inclusion on the Specialised Occupation List (SpOL). This list is reviewed on an annual basis. Most occupations identified in our research are already on the Specialised Occupations List.

The presence of these occupations on the Specialised Occupations List indicates that they fulfil the criteria: they are considered high value, representing a long lead time and a good match between training for the occupation and working in it. This highlights the importance of keeping ahead of trends in relation to energy efficiency, particularly if there is further expansion of initiatives in these areas. The strong presence of these occupations in the Specialised Occupations List also underlines the value of undertaking additional work in these areas.

Recommendation 2: Occupations impacted by energy efficiency be highlighted in Skills Australia's annual skill strategies for specialised occupations

It is recommended that Skills Australia prioritises occupations highlighted in this research, such as electricians, plumbers, and refrigeration and air conditioning mechanics, as part of its work in developing consortia of industry and professional bodies to prepare annual skills strategies for specialised occupations.

Regulation and accreditation

It is important that regulatory needs are anticipated and appropriate standards are set in place.

Several interviewees drew attention to regulatory issues associated with new technologies. There is a risk that some workers are installing energy efficiency technologies without adequate training. Interviewees have also indicated that there is a shortage of regulators to inspect the work.

Some respondents were concerned about training quality and how this translates into quality products that consumers can rely on. Appropriate systems for accreditation and renewal of

⁸ As part of the Council of Australian Government's Ministerial Council Reform agenda, from 30 June 2011 the system of Ministerial Councils will be reformed to focus on strategic national priorities and new ways for COAG and its councils to identify and address issues of national significance. MCE will be replaced by a new Standing Council on Energy and Resources, while MCTEE will be replaced by a Standing Council on Tertiary Education, Skills and Employment (http://www.coag.gov.au/coag_meeting_outcomes/2011-02-13/index.cfm?CFID=1532&CFTOKEN=88180711, accessed 21 March 2011). Terms of Reference for the new Standing Councils are currently under development and the work programs of existing Ministerial Councils will not necessarily transfer to the new Councils. All recommendations in this report that refer to MCE and MCTEE should be read to relate to the relevant Standing Councils that replace them after 30 June 2011.



accreditation could benefit from a system of professional development to ensure that practitioners remain up to date.

Skills Australia supports the National Strategy on Energy Efficiency recommendations to develop accreditation standards and systems to support energy efficiency training. This should specifically include the timely development of accreditation standards and systems for new and emerging technologies and processes related to energy efficiency.

Pathways

Skills Australia believes that providing a lifelong career and qualification ladder for existing workers, apprentices and trainees is critical.

Our research has demonstrated that design of qualification and career pathways will be an important aspect of recruiting and retaining people in occupations related to energy efficiency in the residential and commercial building sectors.

Recommendation 3: Industry and the education and training system provide information on career pathways in energy efficiency

It is recommended that industry and the education and training sector ensure that information is provided about career pathways in energy efficiency at trade, post-trade, degree and postgraduate level. This should be the responsibility of MCE and MCTEE.

Implications for the education and training sector

Training needs in the energy efficiency area have implications for all levels of education and training.

Our interviewees drew attention to a complex set of implications that need to be taken into account in policy development, including provider capacity, student demand, training requirements of emerging technologies, problems with incorporating energy efficiency requirements across the board in VET and higher education, and the current lack of research capability in relation to the thermal performance of buildings.

Recommendation 4: Competitive funding be provided through a regional or cluster-based model to develop VET capacity for energy efficiency

It is recommended that MCE and MCTEE make competitive funding available through a regional or cluster-based model to develop VET capacity for energy efficiency skills. This would enable groups of providers to share infrastructure and practitioners to work closely with technical experts, consultants and researchers to expand the curriculum in energy efficiency.⁹ This should be coordinated under the Green Skills Agreement to up-skill VET practitioners in providing effective training and facilitation in skills for sustainability, including energy efficiency.

Recommendation 5: The development of courses in energy efficiency at all levels be included under outcomes-based funding for universities

It is recommended that MCE and MCTEE encourage courses at VET and higher education level to incorporate training in the development of a business case for energy efficiency at all levels, informed by examination of comparable courses in North American universities and colleges.

⁹ The Plumbing Industry Climate Action Centre in Brunswick, Victoria (www.picac.com.au) provides a good model of how this might be done. Plumbers are trained in the centre on energy-efficient technologies such as co-generation and solar thermal air-conditioning. The VET sector is also using the centre to train trainers.



Developing business skills

Facilities managers, environmental/sustainability managers and people in similar roles need training in how to develop a business case for energy efficiency to put to senior management.

Skills Australia supports action under the National Strategy on Energy Efficiency to assist businesses in improving their energy efficiency. Skills Australia recommends that this be extended to the provision of advice in building a business case for energy efficiency in enterprises, including through state and territory programs in relation to energy use for small to medium enterprises.¹⁰ This could be supported by accredited training, such as the Certificate IV in Business Sustainability Assessment.

Recommendation 6: Training in developing a business case for energy efficiency be incorporated into relevant tertiary courses

It is recommended that MCE and MCTEE encourage courses at VET and higher education level to incorporate training in the development of a business case for energy efficiency at all levels, informed by examination of comparable courses in North American universities and colleges.

¹⁰ An example is the Energy Efficiency for Small Business program in NSW.



Vision Australia has the skills to meet energy efficiency needs to 2025

Objectives

Plan workforce needs for energy efficiency	Develop skill strategies for identified occupations	Develop clear career pathways	Address training needs for the VET sector	Address training needs for the HE sector	Develop skills in preparing a business case for energy efficiency
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Actions

Comprehensive workforce development plans to be established for occupations related to energy efficiency in the built environment	Occupations impacted by energy efficiency should be highlighted in Skills Australia's annual skill strategies for specialised occupations	Industry and the education and training system should provide information on career pathways in energy efficiency	Competitive funding should be provided through a regional or cluster-based model to develop VET capacity for energy efficiency	The development of courses in energy efficiency at all levels should be included under outcomes-based funding for universities	Training in developing a business case for energy efficiency should be incorporated into relevant tertiary courses
Workforce development initiatives to be coordinated and communicated across jurisdictions and to all stakeholders					



Introduction

Skills Australia has undertaken a case study of energy efficiency measures in relation to the built environment, specifically the commercial and residential building sectors. The objective of this research is to better understand what will occur in the labour market and the occupations within these sectors in response to efforts to mitigate climate change via improved energy efficiency. The area of energy efficiency was selected as one that is likely to be significantly impacted by climate change mitigation and by new and emerging technologies in the field.

The focus of the research was on issues relating to demand rather than supply, so this report does not cover sourcing energy from renewable technologies such as grid-connected solar photovoltaic. In view of the fact that a number of respondents raised the issue of regulation and accreditation in relation to installations of grid-connected solar photovoltaic technologies, this could provide a fruitful area for further research.

Reducing energy use through energy efficiency strategies has been identified as a highly effective way to reduce global emissions. According to the International Energy Agency, end-use energy efficiency improvements could account for 36 to 44 per cent of global emissions reductions in projections to 2050.¹¹ The Garnaut report suggests that 'there are significant opportunities for increased energy efficiency in Australia that are economically beneficial'.¹² According to the ClimateWorks Australia report *Low Carbon Growth Plan for Australia*, buildings would account for 18 per cent of Australia's greenhouse gas emissions in 2010, comprising 58 per cent for residential buildings and 42 per cent for commercial buildings.¹³ For commercial buildings, between 40 and 60 per cent of energy used is due to heating, ventilation and air conditioning (HVAC) systems.¹⁴

Historically, Australia has enjoyed relatively stable and low electricity prices by world standards for both business and household consumers. Business prices have typically fallen in real terms over the past two decades, partly reflecting the unwinding of cross-subsidies from business to household consumers that began in the 1990s.¹⁵ However, both business and household electricity prices have risen significantly since about 2007. A key factor over 2007 and 2008 was that drought conditions drove up wholesale energy prices.¹⁶ More recently, the main driver behind rising electricity prices is the significant investment required to build new and replace ageing network infrastructure.¹⁷ This investment is necessary to ensure consumers continue to receive a reliable supply of electricity.

While limited data is available on business electricity prices, regulated residential electricity prices will increase by around 11 to 13 per cent in NSW and by around 13 per cent in Queensland over 2010/11.¹⁸ In the longer term, emerging climate change policies will place greater upward pressure on electricity prices as Australia transitions to a low carbon economy. One way for consumers to manage their overall costs is by reducing the amount of energy they use, such as through energy efficiency actions. A rising electricity price will reduce payback times for such actions and should, if information and other barriers are addressed, increase the commercial demand for implementing energy efficiency projects. According to data from the Australian Bureau of Statistics (ABS), 55 per cent of all Australian businesses had an energy efficiency or energy reduction measure in place in 2008-09.¹⁹

11 International Energy Agency (2008), *Energy technology perspectives 2008 in support of the G8 Plan of Action: Scenarios and strategies to 2050*, <http://www.iea.org/textbase/nppdf/free/2008/etp2008.pdf>, accessed 7 October 2010, p.56.

12 R. Garnaut (2008), *The Garnaut Climate Change Review: Final Report*, http://www.garnautreview.org.au/pdf/Garnaut_prelims.pdf, accessed 12 October 2010, p. 404.

13 ClimateWorks Australia (2010), *Low Growth Carbon Plan for Australia*, <http://www.climateworksaustralia.com/Low%20Carbon%20Growth%20Plan.pdf>, accessed 14 October 2010, p. 63.

14 Energy Strategies (2007), *The Measures: HVAC High Efficiency Systems Strategy*, produced for the Equipment Energy Efficiency Committee under the auspices of the Australian and New Zealand Ministerial Council for Energy.

15 AER (2009), *State of the Energy Market 2009*, <http://www.accc.gov.au/content/index.phtml?itemld=904614>.

16 AER (2010), *State of the Energy Market 2010*, <http://www.accc.gov.au/content/index.phtml/itemld/961581>.

17 *Low growth carbon plan for Australia*, p. 63.

18 Based on retail price determinations of the Independent Pricing and Regulatory Tribunal of New South Wales and Queensland Competition Authority respectively.

19 Australian Bureau of Statistics (2010), *Energy, water and environment management 2008-09*, Cat. no. 4660.0. <http://www.abs.gov.au/ausstats/abs@.nsw/4660.0>, accessed 12 October 2010.



As well as the energy used in operating a building, 'embodied energy' can also be a factor in energy efficiency. 'Embodied energy' refers to 'the energy consumed by all of the processes associated with the production of a building, from the mining and processing of natural resources to manufacturing, transport and product delivery'.²⁰ CSIRO research has shown that the energy embodied in the materials of an average house is the equivalent of operational energy use over 15 years.²¹ According to Master Builders Australia (MBA), the issue of embodied energy is a 'sleeping issue' for Australia. The UK already takes into account increases in the projected carbon footprint of buildings at local council level and planning permission can be refused on these grounds. There are significant implications of embodied energy for building and construction; for instance, the amount of embodied energy required for some energy efficiency measures may actually produce negative energy savings over the medium term if embodied carbon is taken into account. (MBA)

The Garnaut report envisages that take-up of energy efficiency opportunities will be slow initially, but accelerate in response to policy initiatives.²² A number of federal and state/territory policies in energy efficiency are either in force already, or will take effect in the near future. These constitute some of the most important drivers for change. Consumer desire to make a difference to the environment is also a potent factor, as is commercial advantage in the form of reduced energy costs or increased returns in the form of higher rents. For example, the Crown Casino Co-generation Project in Melbourne has demonstrated the commercial viability of co-generation technology in addressing energy efficiency.²³ Commissioned in 1999 at a cost of \$3 million, the estimated cost saving of the six engine plant is \$500,000 per year. The plant meets approximately 30 per cent of the casino's power needs.²⁴

International research suggests that energy efficiency policies and programs have the potential to impact the labour market in significant ways. For example, research for the European Commission has found that employment in relation to the thermal refurbishment of buildings, an important aspect of energy efficiency measures for the built environment, could account for 10 per cent of EU employment in the sector by 2030.²⁵ Energy efficiency programs in the UK have resulted in positive job impacts in the areas of manufacturing and installing energy efficiency technologies, including providing employment opportunities for unemployed unskilled workers.²⁶

According to MBA, 'Construction of new, more energy efficient buildings and the retrofitting of existing buildings will require a more skilled workforce'. Skills Australia's research has highlighted current or looming skills shortages in some areas. For example, Victoria has identified a need for 2000 assessors for residential Mandatory Disclosure. (Val MacGregor) However, there is a comprehensive lack of data about skills gaps and shortages on which to base workforce planning in the area of energy efficiency, and this is an issue that needs to be urgently addressed.

The structure of this report is as follows. The first section considers key findings of the research. These include: the primary drivers of change; the occupations involved in the process of developing or retrofitting a commercial or residential building for energy efficiency; emerging occupations; upskilling requirements; anticipated skills shortages; and issues relating to regulation and accreditation raised at interview. The second section provides discussion and recommendations arising out of the findings. This section covers: workforce planning and skills needs for identified occupations; coordinating policy development at a national level; regulation and accreditation issues; developing career pathways; and addressing implications for the education and training system. The section concludes with a discussion of skills needs in relation to the development of business cases for energy efficiency.

20 *Technical manual: Design for lifestyle and the future*, <http://www.yourhome.gov.au/technical/fs52.html>, accessed 17 November 2010.

21 *Technical manual*.

22 The Garnaut Climate Change Review, p. 480.

23 Cogeneration is a system that generates electricity using a gas engine while recovering waste heat for reuse in buildings (http://www.gec.jp/ESB_DATA/EN/tech/html/esb-120.html, accessed 11 November 2010).

24 Crown Casino Cogeneration Project, <http://www1.home.energy.wa.gov.au/pdf/Case%20Study%20Crown.pdf>, accessed 11 November 2010.

25 European Commission Directorate-General Environment (2008), *Environment and labour force skills: Overview of the links between the skills profile of the labour force and environmental factors*, http://ec.europa.eu/environment/enveco/industry_employment/pdf/labor_force.pdf, accessed 19 November 2010, p. 21.

26 Syndex (n.d.), *Climate change and employment: Case of the United Kingdom*, <http://www.etuc.org/IMG/pdf/RapportRU-2.pdf>, accessed, 19 November 2010, p. 47.



Methodology

The research method was qualitative research carried out through semi-structured interviews, combined with document analysis. Nine interviews were conducted, with:

- The Australian Institute of Refrigeration Air Conditioning and Heating (AIRAH)
- The Communications Electrical Plumbing Union (CEPU)
- The ElectroComms and Energy Utilities Industry Skills Council (EE-Oz)
- The Green Building Council of Australia (GBCA)
- Master Builders Australia (MBA)
- Prof. Suzanne Benn, Director, Australian Research Institute for Environment and Sustainability (ARIES), Macquarie University
- David Hood, Chairman, David A. Hood & Associates, Consulting Engineers, and Adjunct Professor, Faculty of Built Environment and Engineering, Queensland University of Technology
- Val MacGregor, Green Skills Training Manager, Sustainability Victoria and Chair, National Framework for Energy Efficiency (NREE) Trades and Professions Training and Accreditation Committee
- Dr Glenn Platt,²⁷ leader, CSIRO energy technology demand side energy systems group.

In addition to evidence drawn from these interviews, this report draws on a number of other sources of data and information identified in the course of the interviews and associated research.

A list of interview questions is at Appendix A.

27 Comments made by Glenn Platt are his views only and do not necessarily represent the views of CSIRO.



1. Findings

This section begins by considering key drivers of change. Following an examination of the occupations associated with each stage in the development of a commercial or residential building, findings in relation to emerging occupations and upskilling requirements for existing occupations are discussed. The section goes on to consider anticipated skills shortages, issues relating to regulation and accreditation arising from the research, and the skills implications of new and emerging technologies.

1.1 Key drivers

State and federal government programs promoting energy efficiency in the built environment are key drivers of change, as are more environmentally responsible consumers, and bottom-line incentives of reduced energy costs.

A number of programs at both national and jurisdictional level have been developed to promote emissions reduction through more efficient use of energy. Some of these initiatives apply across the built environment, while others are targeted specifically at the commercial or residential sector.

Initiatives impacting on energy efficiency at the national level are listed below; details of these (including which body is responsible for the initiative), and relevant state and territory programs, are at Appendix B.

Broadly based national initiatives

- The National Greenhouse and Energy Reporting Act (NGER)
- The National Framework for Energy Efficiency (NREE) (this came to an end in 2010 and actions under the NREE are being transitioned into the National Strategy on Energy Efficiency)
- The National Strategy on Energy Efficiency (NSEE)
- National Energy Efficiency Skills Initiative (NEESI) (under development)
- Energy Efficiency Opportunities (EEO) program
- HVAC High Efficiency Systems Strategy (HESS)
- Minimum Energy Performance Standards (MEPS)
- Greenlight Australia
- Review of the energy audit Australian Standard (AS/NZ 3598) (currently underway)
- The National Australian Built Environment Rating System (NABERS)
- Energy Efficiency in Government Operations (EEGO)
- Building Code of Australia (BCA) 2010²⁸
- City Switch Green Office.

²⁸ From May 2011 the Building Code of Australia will be replaced by the National Construction Code, which consolidates codes from the building and plumbing industries.



National initiatives specifically targeting the commercial building sector

- Mandatory Disclosure of Commercial Office Building Energy Efficiency (Commercial Building Disclosure) (effective 1 November 2010)
- In From the Cold
- The Green Building Fund
- Green Lease Schedule
- The Green Star Rating System.

National initiatives specifically targeting the residential building sector

- Residential Building Mandatory Disclosure (RBMD) (not yet in effect).
- The Nationwide House Energy Rating Scheme (NatHERS)
- Phase-out of electric hot water systems.

Of these, the MBA sees commercial and residential Mandatory Disclosure, along with the move to six-star rating for residential buildings nationally under Section J of the Building Code of Australia 2010, as the most significant for the building and construction industry.

The Prime Minister's Task Group on Energy Efficiency has recommended the establishment of a national energy savings initiative which would set an obligation on energy suppliers to constrain demand among their customers. Similar schemes have already been implemented in NSW, South Australia and Victoria. This, and other actions proposed for consideration in the *Report of the Prime Minister's Task Group on Energy Efficiency*, would if implemented become key drivers for future change.

The *Report of the Prime Minister's Task Group on Energy Efficiency* draws attention to the problem of split incentives resulting from a variety of programs and initiatives. Different stakeholders (builder, developer, owner) bear different costs and can have different incentives associated with different targets. This can make it difficult to have all stakeholders working towards the same goals.²⁹

In addition to policy drivers, change in the commercial and the residential sectors may also be driven by altruistic desire to act responsibly towards the environment, or bottom-line incentives to reduce energy costs. In many cases there can be a combination of several motives, for example where individuals or companies are encouraged into climate-friendly action by government subsidies, seeing themselves as saving money and helping the environment at the same time.

1.2 The commercial building sector and its occupations

Energy efficiency skills will be needed for a wide variety of occupations involved in creating a commercial building from construction through commissioning to maintenance.

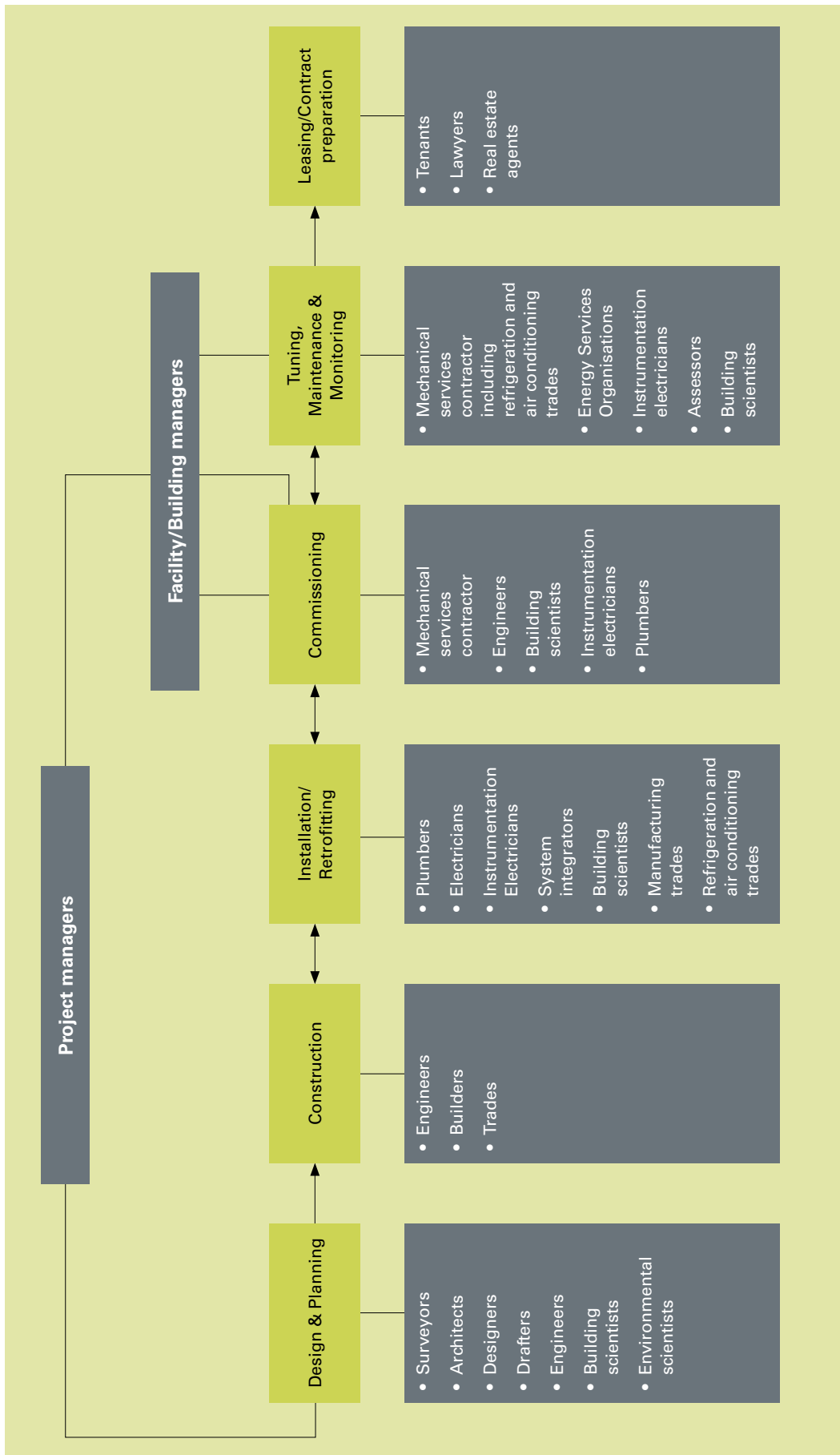
Figure 1 demonstrates the process of developing a commercial building, the occupations involved, and skills associated with those occupations in relation to energy efficiency.

The process of creating a commercial building from the drawing board through construction to the subsequent monitoring and maintenance of the building for energy efficiency has implications for a wide variety of occupations which will need energy efficient skills integrated into training, such as engineers, designers, building scientists, facility managers, installers, consultants, maintainers, assessors and trades workers such as electricians and plumbers.

²⁹ *Report of the Prime Minister's Task Group on Energy Efficiency*, p. 33.



Figure 1: Commercial Building Sector—construction stages and implications for occupations and skills needs



1. Design & Planning

According to the GBCA, 'As many rating tools, such as Green Star, demonstrate, the earlier that sustainability and energy efficiency initiatives are factored into the design and planning of buildings, the more opportunities exist for them to reduce the project's environmental impact throughout its lifetime'. Occupations involved in the design and planning stage include designers, drafters, engineers and architects. Environmental scientists may be consulted on a range of issues relating to energy efficiency. The project manager conveys the Green Star rating target and requirements of the client to the designers and planners, and plant and equipment are selected accordingly.

2. Construction

The construction stage involves occupations such as project managers, engineers, builders and various trades such as electricians and plumbers. Specialists in civil, mechanical and materials engineering can also play a role. Those involved need a sound understanding of relevant regulations such as the Building Code of Australia and the Australian/New Zealand Standard for Wiring Rules (AS/NZS 3000).³⁰

3. Manufacturing

Jobs and skills in the manufacturing industry are also implicated in energy efficiency measures for the built environment. For example, a number of Australian manufacturers specialise in products such as double-glazed windows for commercial and residential buildings. As up to 40 per cent of a building's energy loss can occur through glass, double glazing offers a sustainable investment for consumers to reduce their heating and cooling costs. Other Australian manufacturers specialise in window and door seals which can reduce energy use by as much as 15 per cent. Australian manufacturers are also producing energy efficient LED lights and light fittings as well as developing new technologies in this area. As LED lighting can use as little as 10 per cent of the energy required for conventional lighting, it is expected that LED lighting will feature more prominently in the built environment into the future.

There are also implications for occupations in research and development of energy-efficient materials.

4. Installation/Retrofitting

The installation stage involves plumbers, electricians, mechanical services contractors and other trades that install various systems involving lighting, data monitoring, cooling and heating. According to EE-Oz, specialist skills in the integration of electrical/electronic and instruments systems require electricians with high level post-trade skills. Many energy-efficient technologies such as heat pumps and co-generation systems are installed by plumbers.

Retrofitting new technologies in older buildings is an important aspect of achieving improvements in energy efficiency. New build represents only a very small proportion of the whole market (of the order of two to three per cent).³¹ Eighty-one per cent of Australia's existing office stock is over ten years old, with the lower grades of offices having the highest ratio of old stock.³² Monitoring of energy use leads to improved performance, especially if a building has had the same plant and equipment installed for a long time. According to David Hood, there is a strong design element in this work, which must include engineers with specific skills in energy efficiency of buildings. There are many skills common to both new build and retrofit.

³⁰ For further information on enhanced energy efficiency measures under Section J of the Building Code of Australia 2010, see Appendix B.

³¹ For example, figures from the Property Council of Australia based on thirty office markets in capital cities and fringe markets show that 3.6 per cent net volume has been added to commercial space in new build since July 2009.

³² Davis Langdon (2009), *Retrogreening offices in Australia*, <http://www.davislangdon.com/upload/StaticFiles/AUSNZ%20Publications/Technical%20Reports/Retrogreening-offices-in-Australia.pdf>, accessed 19 November 2010, p. 2.



5. Commissioning

This stage sees the handing over of the building to the principal who takes ownership either as the client, or on behalf of the client. The same organisation is normally responsible for construction and commissioning. Occupations include building scientists, engineers, instrumentation electricians, plumbers and other HVAC trades.

Instrumentation electricians investigate problems, carry out programming and configuration changes, and recommend system improvements with a particular emphasis on energy efficiency. Facility managers work with the instrumentation electricians and engineers to ensure that the building systems are tuned to maximise efficiency.

6. Leasing/Contracts

The leasing/contract stage involves occupations such as real estate agents to assist with finding tenants, and lawyers to draw up contracts. Real estate agents will require knowledge of both the regulations and the commercial value of energy efficient premises as the client may benefit with increased rents, while the tenants save on their energy bills. Similarly, lawyers require a clear understanding of responsibilities and regulatory requirements, both current and impending. A recent and evolving area of new skill requirements is the preparation and negotiation of 'green leases' for the Green Lease Schedule (see details in Appendix B).

7. Tuning, Maintenance & Monitoring

'Commissioning and building tuning are usually linked and involve the same company, especially during the Defects Liability Period (DLP) where the owner/occupier will be trying to obtain their actual green star rating [as opposed to their target rating]. After the DLP stage the construction/commissioning company (mechanical services contractor) through their maintenance arm will offer repeat tuning services. Mechanical services at a commercial level (equipment and control) is the most significant point for energy wastage or efficiency in day to day building operations'.³³

This stage involves multiple occupations whose role is the maintenance or monitoring of energy inputs and outputs. These include facility managers, building scientists, energy efficiency assessors, external contractors and even accountants, although some of these roles (for example energy efficiency assessors) may be much broader. According to AIRAH, 'Occupations will be affected in terms of needing a base awareness of energy efficiency issues and 'tuning' a building for greater efficiency'.

Managers and accountants who work in this area will be less technical in their role and more data driven. Their main role will be to monitor the input and output of a building's energy rather like the way that an accountant would monitor a business's cash flow.

The next section explores occupations and skills associated with energy efficiency in residential buildings.

1.3 The residential building sector and its occupations

Additional skills will be needed for occupations involved in the residential sector for both new build and retrofit.

Figures 2 and 3 illustrate the process of constructing a new residential building, as well as retrofitting existing residential buildings. The diagram relates to a house or townhouse rather than a large apartment block. The number of new houses commenced in Australia was 113,000 in the year to 30 September 2010, with 171,000 dwelling units built in total (including apartments and other strata living arrangements).³⁴

A major difference between commercial and residential buildings is the lack of management roles in the process of construction and the maintenance of the building. Much of this work becomes

³³ Information provided by Kyle Paten, A.G. Coombs Pty Ltd.

³⁴ Australian Bureau of Statistics, *8750.0 Dwelling Unit Commencements*, September Quarter 2010.



Figure 2: Residential Building Sector

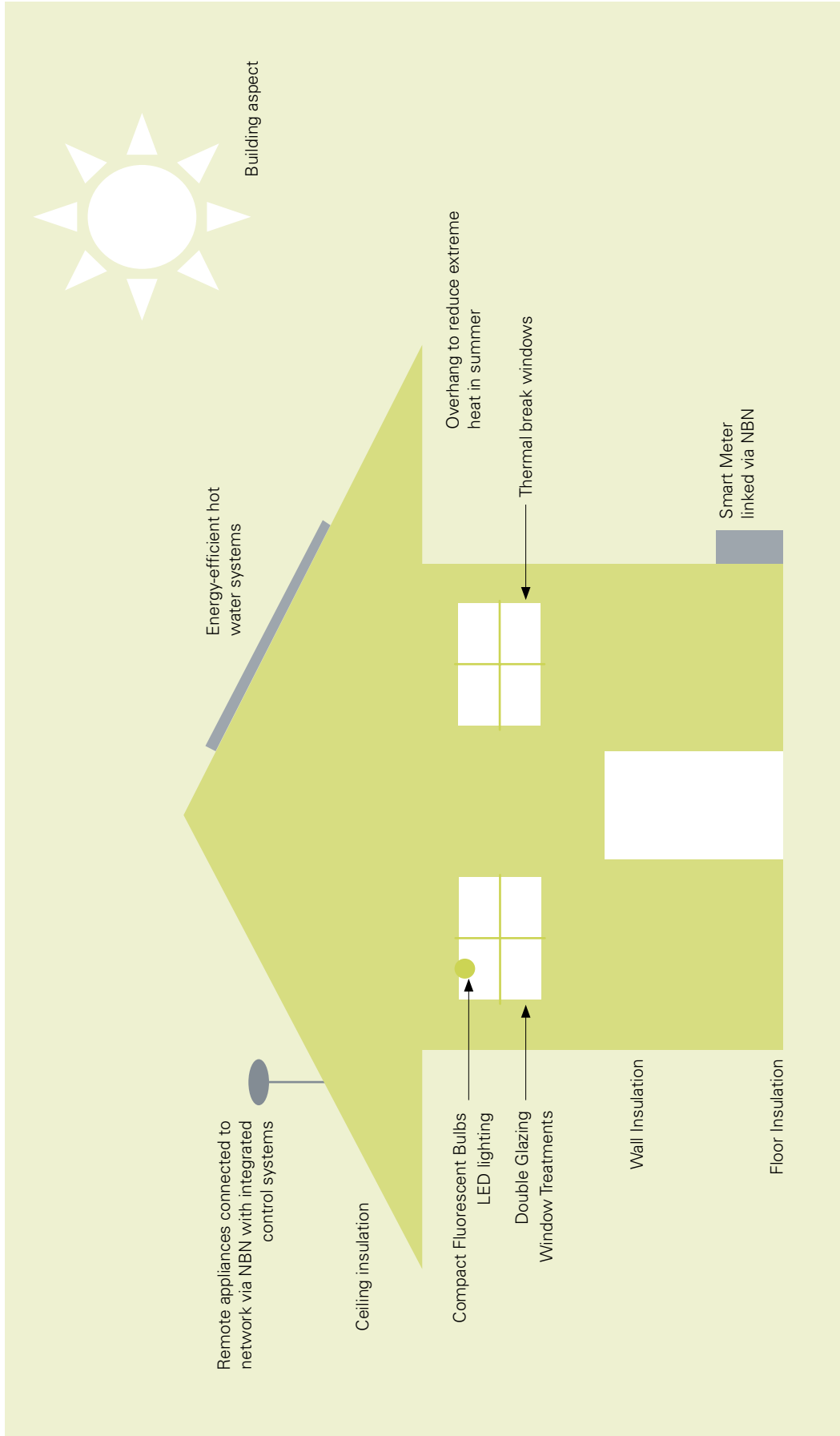
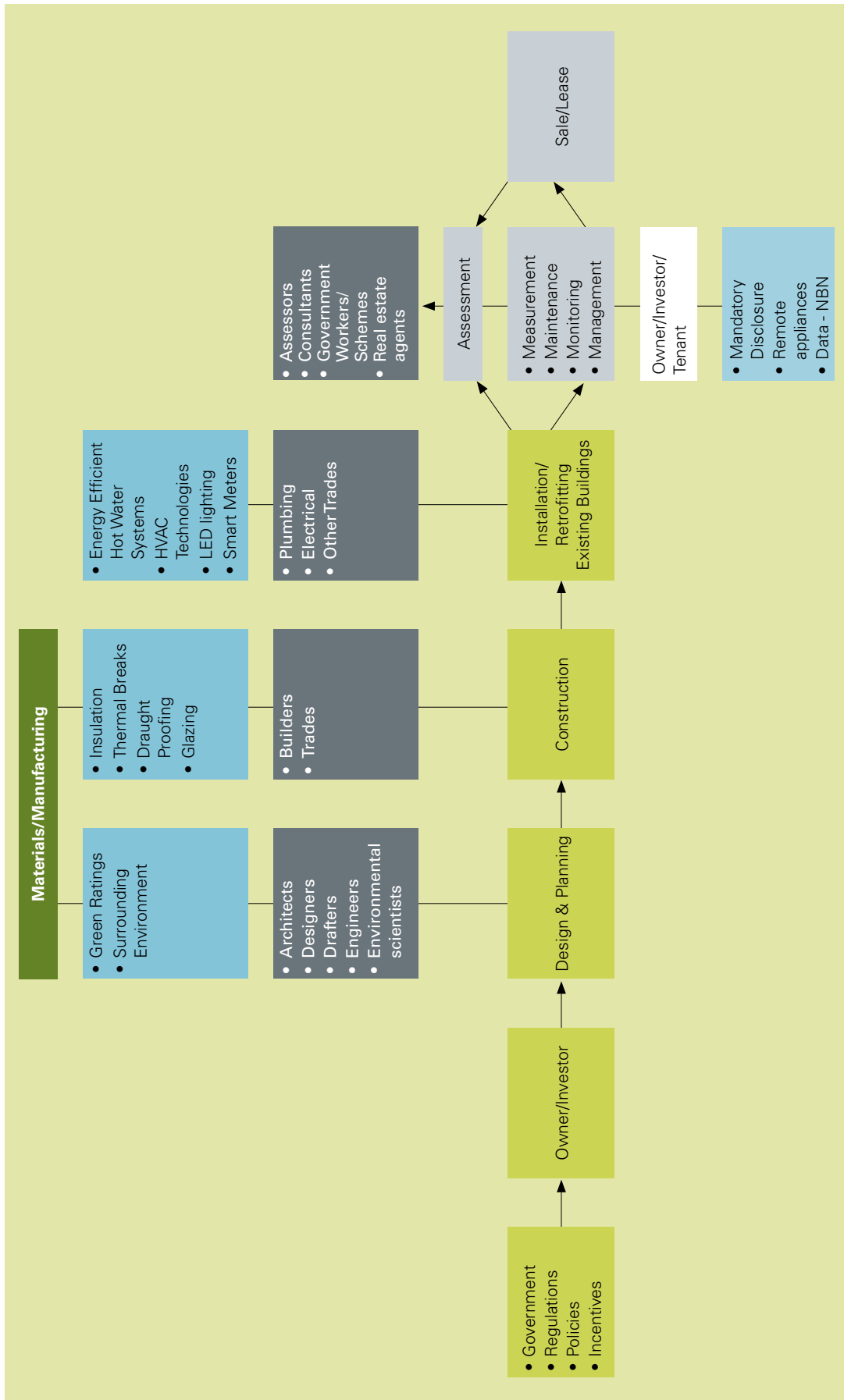


Figure 3: Residential Building Sector



the responsibility of the owner, investor or builder, who must abide by government regulations at all levels, and is likely to take into account possible incentives that may exist in the market. Figure 3 also demonstrates the role of continuous improvement after completion as new technologies enter the market and new policies come into effect.

1. Design & planning

This stage involves occupations such as architects, designers, engineers and builders. Builders, for example, require sufficient understanding of energy efficiency to be able to properly assess whether certain technologies are energy efficient or not. (David Hood)

2. Construction

This phase relies on occupations such as builders, plumbers, electricians and glaziers. As companies update and refresh their product range, new designs may require new skills to build the home. This may require builders and trades workers to become familiar with new materials and the recycling of old materials.

3. Marketing

Real estate agents have a key role to play. According to David Hood, this industry currently lacks understanding of energy efficiency principles in relation to buildings and there is scope for training here.

4. Installation/Retrofitting

Retrofits to improve the energy efficiency of older buildings will require broader skill sets from trades and para-professionals as the design and installation will require a working knowledge of outdated and non-compliant systems and how these may be safely and effectively updated and/or replaced. In-depth knowledge of construction and installation methodologies, occupational health and safety and risk assessment skills will underpin this work.

In retrofitting existing buildings, measures to improve energy efficiency include: 'installation of improved insulation, tinted windows, draught proofing, outside colour alteration, solar hot water and other similar measures'.³⁵

5. Monitoring & Assessment

The assessment stage involves occupations in home energy assessment to assist home owners and tenants with assessing their energy usage. While some smart systems technologies for the home are currently being deployed to a limited extent via existing internet and mobile technologies, a National Broadband Network would be a key enabler for the take-up of these technologies across the economy. (EE-Oz)

In both the commercial and the residential sectors, monitoring, maintenance and assessment may best be thought of as a cycle, as illustrated below.

³⁵ Master Builders Australia, *Submission to the Prime Minister's Task Group on Energy Efficiency*, p. 5.



Figure 4: The energy efficiency assessment/management cycle



As energy efficiency becomes the accepted paradigm underpinning the design, construction and management of the built environment, the cycle illustrated above will be ongoing and may be reinitiated by changes in regulatory frameworks, technologies, incentives and industry work practices. The cycle may also be applied at different levels, for example at system, whole-of-business or at the level of individual processes or equipment.

This cycle involves a number of existing and emerging job roles in energy efficiency assessment, management and improvement. Seeing energy efficiency as a cycle indicates that these roles are supportive of each other and that the roles may merge either with time, or depending on the level at which the cycle is applied.

Source: EE-Oz

1.4 Emerging occupations

Occupations in energy assessment for residential buildings are key for energy efficiency. There are several roles, depending on whether interventions are primarily active (for example, the installation of a heat pump) or passive (for example, the aspect of a new home). Trades occupations involved in the first type of assessment include both plumbers and electricians. The occupation of building scientist is also in shortage.

David Hood identified new occupations as being 'more in the operational arena for maintaining energy efficiency (building tuning, retrofitting and maintenance'. EE-Oz states that 'measurement and monitoring must underpin management strategies'. (EE-Oz) David Hood commented further that:

In the past, metering has largely been driven by commercial imperatives (cost recovery from tenants), and not by any consideration of energy efficiency. Smart metering and timed data linking is required to effectively manage energy consumption. This emerging area requires new skills.

Glenn Platt identified the occupation of building scientist as one that is both crucial for energy efficiency, and also in shortage (see case study of this occupation at Appendix D).

In both the commercial and the residential building sectors, jobs growth is expected in the area of energy auditing and energy monitoring. There was some debate about which occupations could be described as 'new'. While EE-Oz identifies energy auditing as an emerging occupation in their 2010 environmental scan, David Hood was of the view that 'this is not a new occupation, although it has increased in significance'. According to AIRAH, 'In the early 80s, energy audits were taking place due to the oil crisis. AIRAH has been delivering training and individual accreditation since 2002'. Nevertheless, 'enterprises are already developing business models around energy measurement, monitoring and managing energy use, based on assessments of existing systems, advice on new or improved systems and actions to implement these. Whilst this may not be a new occupation it is a new way of working that will require new skills in a similar way to the introduction of personal computers to accounting'. (EE-Oz)



As Glenn Platt commented,

There is growing demand for people advising on improving energy efficiency, or reporting on consumption against regulatory frameworks such as Mandatory Disclosure as it comes into effect for both residential and commercial buildings. This would include electricians to install technology to measure consumption, and energy consultants, e.g. engineers advising on energy consumption.

Rigorous energy efficiency assessments involve project planning, communication, understanding energy use, identifying opportunities, detailed investigation, business decisions and implementation, and tracking and communication. The range of skills required to undertake energy efficiency assessments are unlikely to be found in one person. A key requirement of the EEO program, for example, is that assessments should involve a broad cross-section of people in order to effectively identify and evaluate energy efficiency opportunities, provide fresh perspectives and make the business case. Senior management buy-in and support are among the most important factors determining the success of an energy efficiency assessment. Sufficient buy-in will help ensure assessments receive high priority and the required resources.³⁶

According to EE-Oz, needs are expected to change over time as energy efficiency becomes a commonly adopted paradigm, related technologies are disseminated into the community, and more of the economy is subjected to mandated energy efficiency standards.

Occupations in energy assessment for residential buildings are key for energy efficiency. There are several roles, depending on whether interventions are primarily active (for example, the installation of a heat pump) or passive (for example, the aspect of a new home). Trades occupations involved in the first type of assessment include both plumbers and electricians.

The second form of assessment can include behavioural aspects such as the way occupants use the building, including freestanding appliances such as refrigerators. An example would be closing blinds to avoid heat loss. This kind of assessment is covered in the Certificate IV qualification in Home Sustainability Assessment. Roles for assessors under the new policy for Residential Building Mandatory Disclosure (not yet in effect—see Appendix A for details) are seen as a subset of Home Sustainability Assessment. (Val MacGregor)

The assessment is also covered in the Certificate IV for Business Sustainability Assessors, a qualification developed by Environment Australia and funded through the Department of Education, Employment and Workplace Relations.

1.5 Upskilling requirements

Commercial buildings

New skills were identified by interviewees in the fields of energy management, building monitoring, systems monitoring, understanding carbon and understanding building performance. The latter is seen to be a significant gap at present.

The GBCA is of the view that ‘existing occupations are likely to see considerable evolution and a steady adaptation to the changing market’. In addition to more technical skilling requirements related to specific roles, broader and deeper generic knowledge is needed in specific areas related to energy efficiency: ‘Electricians will need a wider knowledge of energy including energy flows and where energy is going’. (Glenn Platt)

A NFEE report proposing a *Long Term Training Strategy for the Development of Energy Efficiency Assessment Skills* found that large energy-using companies from a cross section of sectors³⁷

³⁶ Department of Resources, Energy and Tourism (2010), *Report for long term training strategy for the development of energy efficiency assessment skills*.

³⁷ Research methodology included consultation with a range of large energy using corporations in the mining, manufacturing, transport, commercial services and energy services sectors, as well as professional associations and government. The ‘Commercial, retail and services’ sector was included in this research; however findings highlighted in this report and below reflect input from all sectors. See Appendix C.



require a number of skills to undertake energy efficiency assessments. The research identified particular gaps in energy data collection and analysis, use of monitoring equipment, developing a business case to senior management for energy efficiency assessment and implementation, and ability to integrate findings into business plans and practices. As well as appropriate skills, personnel require relevant knowledge and experience in that sector, and they need to be available to contribute to assessments.³⁸

An insight emerging from the Low Energy High Rise (LEHR) project conducted by the Warren Centre, University of Sydney was that maintenance people often lack technical know-how, while systems operators often do not have any detailed and technical understanding of HVAC systems in their buildings.³⁹ According to AIRAH,

The new technologies need to be incorporated into the systems approach. It's important that the installation, operation and maintenance of the new technologies are understood. If the technologies are too complicated there is a good chance that poor energy outcomes will ensue.

As one respondent commented, 'this indicates a requirement for higher-level skills for systems operators as systems become more sophisticated.' (EE-Oz)

A strong knowledge of data systems and how to read energy data is required.' According to EE-Oz,

This role requires a post-trade qualified electrical specialist able to provide input into the whole energy efficiency process. The impact of enhanced measurement, maintenance, monitoring and management functions associated with the roll-out of the National Broadband Network (NBN) will mean that these roles may emerge rapidly as NBN technology becomes available and smart appliances become ubiquitous.

The need for blending of knowledge was identified by Glenn Platt as 'a new and dramatic development'. As smart meters are a telecommunication device, 'installers need this blended knowledge to establish communications networks to talk to meters'. According to EE-Oz,

Metering is a key enabling technology of energy management by Electricity Supply Industry networks and will enable joint consumer/provider control and management of local systems and individual appliances. The NBN will empower this. Up-skilling will flow from this at trade/post-trade levels.

A number of interviewees emphasised that the role of facility or building managers will be an important one for the future, since their knowledge and skills in relation to energy efficiency will be crucial to the auditing, monitoring and overall functioning of a commercial building to comply with regulations (see case study of this occupation at Appendix D):

These changes and initiatives will affect the performance measurement of buildings, so roles such as facility managers will become more important especially in terms of understanding what the building systems and technology are intended to do and how they are actually performing. Facility managers will need to know how energy efficiency systems work and how to operate and maintain them to ensure the best outcomes. (AIRAH)

EE-Oz indicated that 'a rise in technological sophistication, complexity and integration will require increased knowledge and skills'. In response to these challenges, AIRAH has recently launched an online interactive course in Sustainable Building Operations for Facility Managers⁴⁰ and a vocational graduate certificate in Energy Efficiency for Facility Managers.⁴¹ The course aims to educate participants on the issues of climate change and understanding how to operate a sustainable building. There is a national qualification in Facilities Management at Certificate III, IV, Diploma and Advanced Diploma levels.

38 Department of Resources, Energy and Tourism (2010), *Report for long term training strategy for the development of energy efficiency assessment skills*, p. 3-4.

39 The Warren Centre (2007), *Low energy high rise building research study: Literature review*, p. 34.

40 The Australian Institute of Refrigeration, Air Conditioning and Heating (2010), Sustainable building operations, <http://www.airah.org.au/Content/NavigationMenu/ProfessionalDevelopment/TrainingCourses/SustainableBuildingOperations/default.htm>, accessed 6 October 2010.

41 Vocational Graduate Certificate in Energy Efficiency for Facility Managers, <http://www.airah.org.au/Content/NavigationMenu/ProfessionalDevelopment/GraduateCertificate/EnergyEfficiencyforFacilityManagers/default.htm>, accessed 25 March 2011.



Many roles requiring knowledge of energy efficiency are in middle management, including environmental or sustainability managers. Skills to bring together technical and financial awareness to develop a business case for energy efficiency are lacking at present. This has been described as a significant issue:

We need people to bridge the existing gap between technical specialists and management. At middle manager level there is a need for understanding of technical aspects to be able to communicate with senior management. There are financial and strategic implications here. (Suzanne Benn)

A rigorous energy efficiency assessment involves communication skills to exchange, convey and express knowledge and ideas in an energy efficiency assessment context. It also requires decision-making skills to present the business case in a way that is meaningful to all relevant levels and areas of management, to understand financial decision making processes, key performance indicators and minimum acceptable rates of return required by the business, and to integrate energy efficiency projects and goals into cross-business operational plans, procedures and key performance indicators.⁴² This challenge has been identified and addressed by the Department of Education, Employment and Workplace Relations in a project managed by Agrifoods Australia and conducted by Energetics Pty Ltd. The project, *Carbonproof–Sustaining the food processing chain*, found that cultural change led from the top, across a whole enterprise, is the most effective means of achieving true business sustainability. At the same time the leadership skills required to achieve it are arguably the least well understood, implemented and funded.⁴³

According to Suzanne Benn, 'Organisations struggle to find who to go to for help with a business case to see which efficiencies will pay off'. Ultimately businesses need to know who to go to, and what product they will receive when they invest in energy efficiency. One emerging approach is energy performance contracting by energy services companies (ESCOs). The contracting company is hired to improve energy efficiency and guarantees a level of savings. They take on a project management role and are paid out of the savings made.⁴⁴

The LEHR research found that 'Buildings perform better where all members of the building management chain feel they can influence building energy efficiency'. Further, 'Managers who considered that they had a greater level of energy efficiency skills were generally found to operate buildings more effectively'. The research found no evidence of a relationship between highest formal qualification level and building performance, a finding which 'probably reflects the lack of energy efficiency content in the qualifications that are available'.⁴⁵

Just under 40 per cent of construction workers do not have formal qualifications.⁴⁶ According to the MBA,

This makes it difficult to upskill to counter skills gaps. Recognition of Prior Learning (RPL) is not straightforward as people who are project-trained rather than having formal qualifications (which is particularly common in the finishing trades such as painting) can have significant skills needs requiring gap training. In addition, existing workers are concerned about not succeeding in the skills assessment process and so can be reluctant to engage with the formal training system.

A further issue is the extent to which energy efficiency training is offered for construction occupations. 'A number of occupational groups in the construction industry now have sustainability working groups (for example, for plumbers, painters and builders) which are looking at integrating sustainability principles into existing units of competency and developing new units of competency'. (MBA)

42 Department of Resources, Energy and Tourism (2010), *Report for long term training strategy for the development of energy efficiency assessment skills*.

43 See Carbon proof AgriFood skills, <http://www.energetics.com.au/testimonials/projects/carbon-proof-agrifood-skills>, accessed 18 April 2011.

44 See, for example, <http://www.melbourne.vic.gov.au/1200buildings/what/Pages/EnergyPerformanceContract.aspx>.

45 The Warren Centre (2009), *Low energy high rise building research study: Final research survey report*, p. 8.

46 Australian Bureau of Statistics, *Education and Work Australia, Employed persons aged 15-74 years, selected characteristics – by level of highest non-school qualification*, May 2010, Cat no. 6227.0, Table 11.



The LEHR project found that one of the major impediments for developers is the lack of comprehensive, authoritative and accessible sources of information on green standards, products and services. Developers do not have a tool to tap into the economic benefits that green building can provide in terms of increased productivity.⁴⁷

Residential buildings

The rate of change of technologies to address energy efficiency in residential buildings presents a significant challenge. EE-Oz commented that 'we understand the demand for skills well, but we don't understand well where the jobs are, because of the continual movement and the rate of change'. Household energy metering is an example: 'In five to ten years the average electrician will have to change the way they work in houses because everything will be monitored and metered individually'. (EE-Oz)

Upgrading standards to achieve six star homes will have implications for skills in the construction area. There are also skills development needs in the area of HVAC. The issue of ceiling insulation for the residential sector remains current:

There is still a need in this area, with training and regulatory requirements. Research shows there is also a reasonable capacity to look at under-floor and wall insulation. This is not typically included in thinking at present. (Val MacGregor)

Lighting is another key area for new skills: 'There are new technologies with LED lighting—electricians should have those skills'. (CEPU)

In relation to retrofitting buildings, another area requiring new skills arises from the phasing out of inefficient hot water systems in favour of more efficient gas or solar hot water. Plumbers and electricians play a major role in this area. Training for plumbers is currently being undertaken around Australia in solar hot water installation. (Val MacGregor)

The Green Skills Agreement (GSA) is an important initiative to address training needs for 'green skills', including energy efficiency, in Australia (see box below).

The Green Skills Agreement

The *Green Skills Agreement* between the Australian and state and territory governments, endorsed by COAG on 7 December 2009, is assisting Australia's workforce and VET sector to adapt and create knowledge, skills and training to meet the requirements of a productive, low carbon, sustainable economy.

The Agreement defines skills for sustainability, also known as green skills, as the technical skills, knowledge, values and attitudes needed in the workforce to develop and support sustainable social, economic and environmental outcomes in business, industry and the community. The skills required to promote and deliver energy efficient products, services and advice across a range of industries are a key component of skills for sustainability.

The four objectives of the Agreement are:

- embedding sustainability practice and teaching in vocational education, within the national regulatory framework
- up-skilling VET practitioners to deliver skills for sustainability
- reviewing Training Packages to embed sustainability principles
- developing a transition strategy to re-skill vulnerable workers.

47 The Warren Centre (2007), *Low energy high rise building research study: Literature review*, p. 31.



In February 2010, the Green Skills Agreement Implementation Group, representing key stakeholders, was formed to progress the implementation of the Agreement. The Group presented the Green Skills Agreement Implementation Plan to the Ministerial Council for Tertiary Education and Employment (MCTEE) in June 2010.

Work is underway to achieve these objectives:

- The Innovation and Business Skills Australia Industry Skills Council has developed a training unit to assist the Australian VET sector and the VET workforce to deliver and assess training for sustainability. The new unit has been added to the elective pool for the Diploma of Training and Assessment, and will form part of a skill set in the new Training and Assessment Training Package designed to underpin professional development programs for VET practitioners.
- The 11 Industry Skills Councils (ISCs) have largely completed the revision of relevant Training Packages to incorporate skills for sustainability. The majority of ISCs submitted final reports on this work in early February 2011.
- In December 2010, DEEWR engaged Ithaca Group to undertake research into good practice in skills for sustainability professional development programs for VET practitioners. The project, which is due for completion by April 2011, will examine professional development models currently in use in a range of state jurisdictions and identify the elements and features that contribute to their effectiveness for different cohorts of VET practitioners. The results will lead to recommendations to inform planning to meet this key objective of the *Green Skills Agreement*.

Next steps

- Presentation of the Evaluation Framework on the Green Skills Agreement Implementation Plan and the complementary National VET Sector Sustainability Policy and Action Plan to NSOC and MCTEE in March 2011 for out-of-session approval.
- Working with the NQC to consider options for trialling the NQC's Skills for Sustainability Standards Framework.
- The commissioning of further research to identify sustainable training and employment opportunities for vulnerable workers.

1.6 Anticipated skills shortages

We expect shortages of building scientists, assessors and auditors, refrigeration and air-conditioning mechanics, VET teachers, and people with qualifications and experience in delivering sustainable business solutions.

Val MacGregor described the issue of meeting the need for new workers in occupations related to energy efficiency into the future as 'a huge challenge'.

Research on large energy-using companies shows that to undertake rigorous, comprehensive, accurate energy efficiency assessments, companies and services sectors require skills in areas such as metering and monitoring, installation, evaluation and design.⁴⁸

48 Department of Resources, Energy and Tourism (2010), *Report for long term training strategy for the development of energy efficiency assessment skills*.



In the course of the research, the following skills shortages were identified:

- Assessors for Residential Building Mandatory Disclosure (RBMD). Victoria has identified that 2000 assessors will be required in Victoria alone when RBMD come into effect. (Val MacGregor)
- Building scientists: currently there are very few practising as such in Australia. (David Hood)
- Energy auditors. (Val MacGregor)
- Builders and tradespeople with qualifications and experience in delivering sustainable building solutions. (MBA)
- VET teachers, for example in the electrical and refrigeration and air-conditioning trades, and in building and construction. (AIRAH, MBA, Glenn Platt)
- There is also a demand-side lack of people wanting to take up the Certificate III in refrigeration and air conditioning mechanics.⁴⁹ (AIRAH)

In terms of auditing and assessing for the commercial sector, several interviewees emphasised that a team approach to auditing within large organisations can overcome many of the issues associated with specific skills shortages (see section 1.3 above).

The shortage of VET teachers was raised as an issue of concern by a number of respondents. The issue is how to train a new workforce from scratch, with only a few experts currently in their respective fields. As Glenn Platt stated 'Who will teach the courses in both sectors and how do we incentivise current experts to teach rather than work in the area?' The MBA pointed out that the long lead time for VET teachers is a factor in addressing the shortage, especially for sustainable building which requires a triple competency in building, training and techniques for sustainable building.

Some of our interviewees drew attention to demographic effects: 'One of the problems is the ageing workforce as retirement places are not being filled, and if they are being filled, the knowledge base is just not there in those who are replacing the retirements'. (AIRAH) This manifests itself as a long-term challenge within the knowledge base for different industries as 'the current crop are undertrained. This is partly to do with standards and partly to do with culture.' (AIRAH)

1.7 Regulation and accreditation

Accreditation needs to be built into the regulatory framework. Consumers want to be able to rely on quality products.

In the short term, a view was expressed that skills shortages emerging as new policies and technologies drive improvements in energy efficiency would be filled by individuals without the necessary training to safely install and commission products relating to energy efficiency. Anticipation of regulatory needs and the setting in place of appropriate standards are required. A situation where 'the regulators are playing catch-up' (CEPU) significantly increases risk.

An issue arose in relation to accredited courses and how these fit into the energy efficiency landscape. Training packages are reviewed constantly to reflect changes in industry, whilst accredited courses are developed to meet training needs that are not currently addressed by existing training packages.⁵⁰ EE-Oz were of the opinion that 'accreditation systems operate outside industry regulatory frameworks, do not add value and often create confusion for consumers and industry enterprises'.

A wider concern was expressed in relation to the quality of training and how this training translates into quality products that consumers can rely on. As Val MacGregor noted, 'A consumer needs to be able to know what they're getting when choosing who to employ'. A major aspect of concern for

49 This appears to be related to the lack of visibility of the industry, especially among school leavers. See Section 2.5 below.

50 VETinfoNet (2004), Accredited courses Q & A, <http://www.vetinfo.net.det.wa.edu.au/Course/AccreditedCourseFAQs.aspx?menu=1&menuItem=2>, accessed 6 October 2010.



consumers is the terminology used to describe specialisations: ‘What do descriptions like ecosmart electrician, global green electrician or master plumber really mean?’(Val MacGregor).

Val MacGregor also pointed out that ‘the problems with ceiling insulation and green loans provide enough evidence that accreditation needs to be built in [to the regulatory framework]’. Some key issues about who should be responsible for regulation were raised:

Should this be government regulated ...? Government are not always comfortable in becoming regulators, but they need a mechanism for accountability. Should it be handled by a not-for-profit organisation? There is no consensus yet but there is a need for clarity in standards, a code of conduct, benchmarking, and required professional development to maintain accreditation as currently happens for doctors, dentists and lawyers.

(Val MacGregor)

The issue of who should be responsible for the registration of assessors in relation to Residential Building Mandatory Disclosure is a difficult one. The need for national consistency, and more transparent and rigorous regulation and accreditation of home energy assessors was seen by David Hood as an issue that needs to be accorded high priority.

1.8 Skills implications of emerging technologies and services

New HVAC technologies and emerging energy service organisations can be expected to have impacts into the future.

Several new technologies or services were identified in the research with implications for the future, rather than the present, workforce.

New HVAC technologies in residential applications, such as heat exchange ventilators, will potentially require new skills in future. Advice from the Construction and Property Services Industry Skills Council (CPSISC) indicates that residential use is likely to grow in future, but that the base qualification for plumbers equips them well for this role, so that it is a matter of up-skilling for new material and products, rather than new occupations.

Future demand has been identified for energy services delivered to private homes:

There could be extensive opportunities for energy services organisations, which could wrap a household’s entire energy bills into one. This would place huge demands on manpower, probably more than needed to simply meet regulatory requirements. Requirement for training is likely to be at VET/diploma level. (Glenn Platt)

The Report of the Prime Minister’s Task Group on Energy Efficiency raises the issue of accreditation and training for Energy Service Companies.⁵¹ In addition to work being carried out under the National Strategy for Energy Efficiency, the Task Group recommends that the Australian Government work with relevant industry associations, education and training service providers and other stakeholders to develop and promote an ESCO accreditation and training regime.⁵²

51 In relation to the generation and supply of electricity, there are three key functions: generation, transmission and distribution, and retail. These three functions operate in different combinations; for example, the ‘gentailer’ generates and retails but does not distribute. An Energy Services Company operates at the retail level as a contractor to provide a suite of services which can include assessment, advice and action based on the assessment and advice.

52 *Report of the Prime Minister’s Task Group on Energy Efficiency*, p. 182.



2. Discussion and recommendations

2.1 Workforce planning

As new policies and technologies drive improvements in energy efficiency, skills shortages are likely to emerge. We expect that these will be worse in the short and medium term than in the longer term to 2025, although a cost on carbon and diminishing resources such as oil could lead to acute skills shortages in the longer term.

Energy efficiency is a complex area as it encompasses many sectors, and those sectors involve different technologies and move at different speeds. Our research did not provide a consensus on how well placed Australia is to address the skills challenge of increasing energy efficiency and reducing energy demand in the coming decades.

2.1.1 Short, medium and long-term outlooks

Overall, our research indicates that skills shortages are likely to be felt more acutely in the short and medium term than in the longer term to 2025.

Recent policy initiatives have had mixed results, with interviewees pointing to some lessons learnt from recent large-scale initiatives. For example, it was noted that the industry requires some change to meet short to medium term skill needs, particularly in relation to the training and the development and enforcement of standards. (Val MacGregor) Advice from CPSISC supports the view that issues arose because a regulatory framework was not in place. However, some interviewees referred to areas of success:

In the past two to five years we have seen some huge changes. For example we now see more green buildings certified every year than the sum of all the previous years and we are already discussing carbon neutral and environmentally positive buildings. (GBCA)

Several interviewees anticipated workforce issues in relation to programs for commercial buildings due to be implemented in the near future. Glenn Platt commented: 'In the medium term, skills shortages will get worse with commercial and residential Mandatory Disclosure provisions. We don't have an existing base of people who can gain the experience needed to meet burgeoning demand'. There has been no nationally recognised program for assessors undertaking Residential Building Mandatory Disclosure assessments.⁵³ CPSISC advises, however, that a number of Units of Competency have been identified that will be able to address this need in the Certificate IV in Home Sustainability Assessment.

According to research undertaken for the MBA by the Centre for International Economics, raising the star rating of residential buildings will have significant cost implications and will also require additional workforce (although hard to quantify at this stage) in manufacturing and installation of measures such as insulation and extra shading of buildings.⁵⁴

⁵³ Construction & Property Services Industry Skills Council (2010), *Initial discussion paper: Skill and qualification requirements of National House Energy Rating Scheme [NatHERS] and Residential Building Mandatory Disclosure [RBMD] assessors*, <http://absa.millpost.com.au/site.php?id=219>, accessed 17 November 2010, p. 2. See further discussion of business plans at section 2.7 below.

⁵⁴ Centre for International Economics, *Energy Efficiency: What's Optimal, What's Not*, November 2010, <http://www.masterbuilders.com.au/InformationSheets/energy-efficiency-building-code-star-ratings>.



There was optimism from some quarters for the medium term:

In the medium term we are very well placed in this area. The biggest issues or barriers facing the growth of this sector are the perceived costs, the perceived risks and the resources involved. At the moment we have no issues in finding people to do the work, however the knowledge is not yet as great within the residential sector. (GBCA)

As previously mentioned, some sectors were not as confident of tackling the skills issues surrounding energy efficiency in the medium term. In the view of the MBA, there will be a lag in 'green skills' in the short term, whereas in the medium term the industry will change and adapt.

The impact of the continuing mining boom is also expected to affect the workforce in the medium term:

The mining boom is taking people from the east coast. There are numbers of unemployed people as a result of the downturn in the construction industry on the east coast. It is expected that things will pick up in 2011. (CEPU)

In the longer term, interviewees were generally more optimistic about meeting the skills needs of the future across industries. This optimism was associated with better career pathways and confidence in the education and training system to accommodate the skills demand and feed into the workforce:

The long term is a more optimistic scenario. A number of institutions are looking at this area. TAFE students want a career in building energy advice. (Glenn Platt)

However, another view put to Skills Australia is that skills shortages will be felt more acutely in the long-term than the short term since the scale of adjustment to climate change and the impetus for new ways of living and building will be much more significant than at present. The pace of change will increase when carbon attracts a cost and resources become scarcer.⁵⁵ According to the MBA, the construction industry is expecting sustained growth over the next decade, rising from the current level of one million workers to 1.3 million by 2020. Green skills will be an important component of a larger workforce problem.

Whilst it is important to create incentives to increase workforce participation in energy efficiency, there are risks associated with not planning appropriately. Workforce development for Australia's energy efficiency needs in the coming decades is essential. Given the lack of consensus in the research about the outlook for skills in energy efficiency over the short, medium and longer term, this planning will need to be based on a variety of scenarios. This is the approach adopted in Skills Australia's National Workforce Development Strategy.⁵⁶

2.1.2 Apprenticeships

Many of the occupations involved in energy efficiency are trades occupations where apprenticeships are the pathway for entry, such as plumbers and electricians. Long-term planning, and potentially government intervention, will be required to fill the skill needs for trade jobs in identified areas of shortage.

Our research identified problems in both demand and supply of apprenticeships. The lack of demand for the Certificate III in refrigeration and air-conditioning mechanics identified earlier⁵⁷ helps to explain the situation described in the following comment from AIRAH: 'We're poorly positioned in the short term as there are shortages across our industry. At the moment we actually have workers from the UK and Ireland coming over to fill in the gaps due to the shortages'. On the other hand, the CEPU emphasised that 'in the long term, cycles are linked with the number of apprentices in the system' and that 'there are not enough apprenticeships for people doing pre-apprenticeships'.

⁵⁵ This is the view of Caroline Alcorso, NSW Department of Education and Communities.

⁵⁶ See Skills Australia (2010), *Australian Workforce Futures*, pp. 13-17.

⁵⁷ See section 1.5 above.



As we have seen earlier, there are not enough places for people who have completed pre-apprenticeships in relevant areas.⁵⁸ The research suggests that there is more demand for apprenticeships than there are employers willing to offer places. EE-Oz provide the example of numerous applications for a limited number of apprenticeships in the electrical trades in Mt Isa and comment: 'this goes to the capacity of the sector to accommodate those wanting training with jobs'. The plumbing industry, too, has drawn attention to the lack of places for those wishing to undertake apprenticeships in the trade.⁵⁹

It is widely recognised that many secondary students have strong environmental concerns, which could be harnessed via pre-apprenticeship pathways to apprenticeships targeted at occupations related to energy efficiency. As Glenn Platt commented, 'there is a huge interest in environmental issues among young people'. EE-Oz drew attention to the importance of the secondary education sector, and the attitudes it instils in relation to the trades:

There is a question in relation to the capacity of the secondary education sector to service the needs of industry, and to equip students with the incentives and skills to move into the trades. An example is pre-apprenticeship programs. The electricity sector is committed to that'.

There are already additional government subsidies for trade apprenticeships that are in shortage, as identified through the National Skills Needs List (NSNL). Such apprenticeships attract additional subsidies such as Tools for Your Trade and the Kickstart scheme. There is a need to address the shortage of jobs for people undertaking pre-apprenticeships, allowing those who have already demonstrated an interest in the occupation via a pre-apprenticeship to move into a career in that occupation.⁶⁰

If the government were to intervene via targeted apprenticeships, attention to the quality of training would be paramount. Attention should also be paid to student support.

2.1.3 Workforce development

Under the NSEE, the National Energy Efficiency Skills Initiative (NEESI) is being developed as a comprehensive strategy to provide for the future skill requirements of a low carbon economy and the implementation of sustainability strategies. This initiative needs to include workforce development planning.

A number of workforce development planning projects are being undertaken around Australia at federal and jurisdictional levels (see Appendix C for details). Some concentrate on a single occupation, while others are more broadly based. Such initiatives draw attention to what can be achieved by targeted workforce development in relation to energy efficiency. Given the number of occupations that are impacted by the need for energy efficiency knowledge and skills, there is a clear need for a national workforce development strategy that would cover the breadth of occupations involved.

The Prime Minister's Task Group on Energy Efficiency identified the National Energy Efficiency Skills Initiative, along with the Green Skills Agreement (GSA), as 'adequate measures ... to support and equip the energy efficiency sector with the skills needed for the transition to the low-carbon economy' (see details of the NEESI at Appendix B).⁶¹ In Skills Australia's view, it is essential that the NEESI should include workforce development planning in addition to training strategies, and be funded accordingly.

⁵⁸ See Section 1.5 above.

⁵⁹ Information provided by Doug McClusky, CEPU, Board member, CPSISC and former Manager, Plumbing Industry Climate Action Centre.

⁶⁰ The Skills for the Carbon Challenge initiative was introduced to provide an incentive to trade apprentices to undertake training in the area of energy efficiency, but was replaced by provisions reflected in the Green Skills Agreement to ensure that all training packages included appropriate training. For more details on this initiative see section 2.6.3 below.

⁶¹ Report of the Prime Minister's Task Group on Energy Efficiency, p. 196.



2.2 Coordinating approaches to policy development across jurisdictions and stakeholders

Coordination and communication between stakeholders at federal and jurisdictional level, and across industries, is essential to reduce duplication of effort and enhance outcomes.

On 2 July 2009 the Council of Australian Governments signed the National Partnership Agreement on Energy Efficiency to deliver a nationally-consistent and cooperative approach to energy efficiency, including assistance to business and industry to obtain the knowledge, skills and capacity to pursue cost-effective energy efficiency opportunities and therefore meet the challenges of a low carbon economy.⁶² In spite of actions under this agreement, the *Report of the Prime Minister's Task Group for Energy Efficiency* concluded that 'a coherence and consistency to energy efficiency efforts across Australia ... has been missing until now'.⁶³

At interview, a number of respondents addressed the issue of coordinating responses to workforce planning for energy efficiency across the wide range of stakeholders with an interest in this area. At present, energy efficiency sits under the the Ministerial Council for Energy, which consults on the issue with the MCTEE (for example through the development of the NEESI).⁶⁴ Efforts are currently underway to integrate work across the Ministerial Councils and State Training Authorities. (Val MacGregor) Other stakeholders include industry, the Industry Skills Councils (which have some degree of involvement in the issue because energy efficiency affects such a broad range of occupations) and education and training providers at both VET and HE levels.

As we saw earlier, there are a number of policies and programs relating to energy efficiency in the built environment at both federal and jurisdictional level. AIRAH suggested that there is a pressing need for more communication, as 'a lot of people are duplicating work'. EE-Oz suggested that there is a problem with 'competing or conflicting goals [between initiatives at different levels] resulting in waste and duplication of effort'.

Another communication challenge is to promote understanding of energy efficiency across the board: 'How do we mainstream energy efficiency in industry, ISCs, RTOs, and get it understood and embedded? There is work to be done there'. (Val MacGregor) Organisations also need to be able to share information in relation to energy efficiency technologies: 'The setting of benchmarks and sharing of success stories and failures should be encouraged so that newcomers can find solutions to problems and not make the same mistakes as others'. (GBCA)

In *Australian Workforce Futures*, Skills Australia identifies a role for the Australian government in leading a new partnership approach to workforce development at government, industry and enterprise level. Skills Australia supports the role of the NFEE Trades and Professional Training and Accreditation Implementation Group and the Green Skills Agreement Implementation Group in implementing the NEESI and in coordinating and communicating workforce development initiatives across Australia.

62 National Framework for Energy Efficiency, <http://www.ret.gov.au/Documents/mce/energy-eff/nfee/default.html>, accessed 17 November 2010.

63 *Report of the Prime Minister's Task Group on Energy Efficiency*, p. 2.

64 See note 8.



Recommendation 1: Comprehensive workforce development plans be established for occupations related to energy efficiency in the built environment and initiatives coordinated and communicated across jurisdictions and stakeholders

It is recommended that under the National Strategy for Energy Efficiency, the Ministerial Council for Energy (MCE) and the Ministerial Council for Tertiary Education and Employment (MCTEE) develop comprehensive workforce planning for occupations related to energy efficiency in the built environment.⁶⁵ This will include collecting data on identified occupations, identifying skills shortages and oversupply, and considering how to address shortages in the short, medium and long term, with both VET and the higher education sector to be included. To ensure coordination and communication of workforce development initiatives in energy efficiency across jurisdictions and key stakeholders, the working groups under the National Strategy for Energy Efficiency (the National Framework for Energy Efficiency's Trades and Professional Training and Accreditation Implementation Group, in conjunction with the Green Skills Agreement Implementation Group) should be given the mandate and resources to implement the National Energy Efficiency Skills Initiative.

2.3 Addressing skills needs in identified occupations

The strong presence of occupations identified in this research in Skills Australia's Specialised Occupations List underlines the value of undertaking additional work in these areas.

A number of avenues are available to increase the supply of in-demand skills, including addressing identified training needs through industry, government driven training and employment initiatives, and migration. There are various programs that employers and employees can access to fill skill needs.

Skills Australia, in consultation with a variety of stakeholders, assesses occupations based on ANZSCO to determine if they meet set criteria for inclusion on the Specialised Occupation List (SpOL). Specialised occupations are those 'where specialised skills, learned in formal education and training, are needed at entry level and where the impact of market failure is potentially significant'.⁶⁶ In *Australian Workforce Futures*, Skills Australia noted that specialised occupations are those that 'cannot be left to market mechanisms alone'.⁶⁷

In Table 1 (below), occupations identified through the research interviews are mapped against ANZSCO occupation codes and the SpOL. It should be noted that while there was consistency in the language used by interviewees in reference to an occupation, this does not always translate directly into the terminology used by ANZSCO. As a result there are sometimes a number of ANZSCO occupations listed relating to one occupation mentioned in the research. Some are likely to be more directly related to energy efficiency than others.

65 As part of the Council of Australian Government's Ministerial Council Reform agenda, from 30 June 2011 the system of Ministerial Councils will be reformed to focus on strategic national priorities and new ways for COAG and its councils to identify and address issues of national significance. MCE will be replaced by a new Standing Council on Energy and Resources, while MCTEE will be replaced by a Standing Council on Tertiary Education, Skills and Employment (http://www.coag.gov.au/coag_meeting_outcomes/2011-02-13/index.cfm?CFID=1532&CFTOKEN=88180711, accessed 21 March 2011). All recommendations in this report that refer to MCE and MCTEE should be read to relate to the Standing Councils that replace them after 30 June 2011.

66 *Australian workforce futures*, p. 21.

67 *Australian workforce futures*, p. 20.



Table 1: Occupations possibly affected by changes identified in Skills Australia research, by ANZSCO

Occupations identified in Research	ANZSCO occupation code	Currently on SpOL
Facility managers	3129-11 Maintenance planner	No
	6121-12 Property manager	No
Estate Agents	6121-14 Real estate agent	No
	6121-15 Real estate representative	No
Sales Representatives	6113-12 Sales representative (Business Services)	No
Assessors (home, energy and installation)	2333-11 Electrical engineer	Yes
	2334-11 Electronics engineer	Yes
	3121-13 Building inspector	No
	3126-11 Safety inspector	No
	3411-11 Electrician (general)	Yes
	3411-12 Electrician (special class)	Yes
	8214-11 Building insulation installer	No
Instrumentation electrician	3411-11 Electrician (general)	Yes
	3411-12 Electrician (special class)	Yes
	3423-14 Electronic instrument trades worker (general)	Yes
	3423-15 Electronic instrument trades worker (special class)	Yes
Construction professionals and trades, and maintenance tradespeople	1331-11 Construction project manager	Yes
	1331-12 Project builder	Yes
	1332-11 Engineering manager	Yes
	3121-12 Building associate	No
	3129-99 Building and engineering technicians NEC	No
	3331-11 Glazier	Yes
	3341-12 Air conditioning and mechanical services plumber	Yes
	3421-11 Air conditioning and refrigeration mechanic	Yes
	2331-12 Materials engineer	Yes
	2332-11 Civil engineer	Yes
	2332-14 Structural engineer	Yes
	2333-11 Electrical engineer	Yes
	2334-11 Electronics engineer	Yes
	2335-12 Mechanical engineer	Yes
	2339-14 Engineering technologist	Yes
	2339-15 Environmental engineer	Yes
	2339-99 Engineering professionals NEC	Yes
	3122 Civil engineering draftsperson & technician	Yes
	3123 Electrical engineering draftspersons & technicians	No
	3124 Electronic engineering draftspersons & technicians	No
	3121-15 Plumbing inspector	No
	3341-11 Plumber (General)	Yes
	3341-15 Roof plumber	Yes
8211-14 Plumbers assistant	No	



Occupations identified in Research	ANZSCO occupation code	Currently on SpOL
Planners and designers	1399-12 Environmental manager	No
	2321-11 Architect	Yes
	3121-11 Architectural draftsman	No
	2343-12 Environmental consultant	No
Auditors	2212-13 External auditor	Yes
	2212-14 Internal auditor	Yes
Researchers	2343-99 Environmental scientists NEC	No
Educators	2233-11 Training and development professional	No
	2414-11 Secondary school teacher	Yes
	2421 University lecturers and tutors	Yes
	2422-11 Vocational education teachers	No
Telecommunications tradespeople	3132-14 Telecommunications technical officer or technologist	Yes

The majority of occupations identified in the research are already on SpOL. Being on SpOL indicates that they are already recognised as of high value, with a long lead time and good ‘occupational fit’, i.e., where people go on to work in the occupations they trained for. The high proportion of occupations identified as ‘specialised’ suggest the importance of keeping ahead of trends in relation to energy efficiency, particularly if there is further expansion of initiatives in these areas. If there are targeted government initiatives in the area of energy efficiency, it follows that there should also be intervention to consider the need for workforce development initiatives in this area. Connectivity between government policy in areas such as energy efficiency, and skills planning will be important aspects of any such initiatives.

The strong presence of SpOL occupations in the research into energy efficiency underlines the value of undertaking additional work in these areas. *Australian Workforce Futures* highlights the value of establishing a new collaborative planning framework to meet Australia’s skills needs, and recommends funding for strategy development for specialised occupations to support the coordination of consortia of industry and professional bodies to prepare skills strategies on an annual basis for these occupations. It may be that key occupations such as plumbers, electricians and refrigeration and air conditioning mechanics which are identified as important for energy efficiency, but also a range of other industry areas, may be a useful focus for this research.

A number of occupations identified in the research are not listed on the SpOL. For inclusion on the SpOL, three of the following criteria have to be fulfilled: long lead-time; high use; high risk. In addition, the occupation must fit the following criterion: high information—the quality of information about the occupation is adequate to the task of assessing future demand and evaluating the first three criteria. In all cases where occupations identified in the research were not listed on the SpOL, the criteria of long lead time and ‘high use’ were not met. Some occupations also did not meet the third and/or fourth criteria. This suggests that these occupations are relatively unlikely to be included in the future unless there is significant change. Therefore it is expected that demand for these occupations could be met in a relatively short period of time through responsiveness of the market.

For new and emerging occupations or specialist occupations which do not have an ANZSCO code, there is generally insufficient information available to make an assessment against the criteria for inclusion on the list. The table below indicates those occupations that are not currently found under ANZSCO.

For most of these occupations, the research did not indicate the presence of skills shortages. However a shortage was identified for building scientists by the Environmental College of Engineers Australia, who have suggested a ‘desperate’ shortage of skills in the retro-commissioning market.⁶⁸

68 Information supplied by Paul Bannister, Exergy Australia.



Table 2: Occupations not in ANZSCO

Occupation	Training/qualification/professional status	Identified in shortage Y/N through interviews	Evidence for shortage
NatHERS assessor	Course in Building Thermal Performance (residential) (accredited by NSW VETAB)–new national qualification under development 2011	N	
RBMD assessor	Residential performance scheme under development. Potential ‘broad’ competencies for assessors to be developed in 2011.	N	
Green Star certified assessor	Prerequisite is to be a Green Star accredited professional. A further training course is required to become a Green Star certified assessor.	N	
NABERS accredited assessor	Only NABERS Accredited Assessors are able to perform official ratings. These assessors are skilled in the management and operation of buildings, and have expertise in energy and water efficiency, waste management or indoor environment quality. All assessors have met strict selection criteria, attended a training session and passed an exam to gain accreditation.	N	
Building scientist	Engineering qualification with specialisation in building thermal performance	Y	Advice from Environmental College of Engineers Australia and AIRAH

Recommendation 2: Occupations impacted by energy efficiency be highlighted in Skills Australia’s annual skill strategies for specialised occupations

It is recommended that Skills Australia prioritises occupations highlighted in this research, such as electricians, plumbers, and refrigeration and air conditioning mechanics, as part of its work in developing consortia of industry and professional bodies to prepare annual skills strategies for specialised occupations.

2.4 Regulation and accreditation

It is important that regulatory needs are anticipated and appropriate standards are set in place.

Several examples have been identified in the research where jurisdictions have addressed the issues of regulation and accreditation arising from new needs in energy efficiency. Details of the South Australian system for regulation of installation installers, and actions of the Queensland Energy Efficiency Industry Leaders Group (QEEILG) in relation to accreditation and regulation under their Industry Action Plan are provided below.



Case study: South Australian Home Insulation Installers

Prior to the introduction of the federal government's Insulation Rebate Scheme, South Australia already had in place a regulatory system for insulation contractors.

Under the South Australian system, insulation contractors are licensed by the Office of Consumer and Business Affairs (OCBA) under the *Building Work Contractors Act 1995*. Under this licensing system, OCBA was able to utilise the work carried out by the Construction Property Services Industry Skills Council (CPSISC) in packaging existing Units of Competency for insulation work and OHS under the construction training package.

The Units packaged by CPSISC formed the basis of the competency requirements under the federal government Insulation Rebate Scheme and were also recognised for the South Australian registration for 'ceiling insulation in dwellings'.

In the past, South Australia experienced some problems with insulation work, which was addressed through a joint initiative between OCBA and the Office of the Technical Regulator, together with cooperation by industry.

Problems experienced around Australia indicated a need for improved electrical safety awareness, which was taken into account in a new Unit of Competency developed by CPSISC 'Install ceiling insulation'. This Unit is recognised as an alternative to the package of three Units under OCBA's licensing system.

Source: South Australian Office of Consumer and Business Affairs

The Queensland Energy Efficiency Industry Leaders Group

The Queensland Energy Efficiency Industry Leaders Group (QEEILG) is active in the area of skills development and workforce planning. Actions in their Industry Action Plan relating to accreditation and regulation issues include:

- promote stronger relationships and better articulation between the VET and Higher Education sectors for all programs relevant to the industry
- provide recommendations for apprenticeship training within the sector to include broad training on energy efficiency, renewable energy and sustainability principles
- advocate for non-accredited introductory industry programs to be linked to accredited training
- identify all industry participants according to their role (in design, delivery, regulating/approving and/or influencing) so that their key education and training needs can be established
- advocate for any training programs underpinning Government programs to be nationally accredited with training to be delivered only by accredited Registered Training Organisations.

Source: Queensland Energy Efficiency Industry Leaders Group (2010), *Implementation plan for the industry action plan*.



It is clear that accreditation and regulation need to be consistent to reduce risk and confusion and avoid reduced demand for energy efficient products or services when problems arise. Engineers Australia have a system in place where an accredited qualification or assessed equivalent is the first step to registration with the National Engineering Registration Board.⁶⁹ After achieving a required qualification, all applicants must have sufficient practical experience under supervision (with increasing levels of personal responsibility) for engineering work to demonstrate the necessary competencies for independent practice to be registered. Registered engineers are then committed to undertaking continued professional development and practising only within the limits of their area of expertise.⁷⁰ Whilst this may not be a feasible solution for every trade, it provides a model that could be adapted for trades occupations involving new and emerging technologies where risk can be associated with imperfectly trained workers.

Measure 1.2.1 under the NSEE is to:

Develop the National Energy Efficiency Skills Initiative (NSEEI), for approval and implementation in 2010, as a comprehensive strategy to provide for the future skill requirements of a low carbon economy and the implementation of sustainability strategies.

A key element of this measure is to:

Develop accreditation standards and systems to support the value of energy efficiency training and provide consumers with confidence in accessing energy efficiency services.⁷¹

Skills Australia supports recommendations under Measure 1.2.1 of the NSEE to identify training, accreditation and higher education needs associated with the development of energy efficiency skills across the economy, and recommends that this should specifically include the timely development of accreditation standards and systems for new and emerging technologies and processes related to energy efficiency in the built environment.

2.5 Pathways

Skills Australia believes that providing a lifelong career and qualification ladder for existing workers, apprentices and trainees is critical.

The provision of clear pathways to relevant qualifications will be an important role for the education and training system. Our research demonstrates that design of qualification and career pathways will be an important aspect of recruiting and retaining people in occupations related to energy efficiency in the residential and commercial building sectors. Glenn Platt commented:

If we don't establish readily-identifiable training and say already-existing courses are appropriate, how does an electrician wanting to transfer to an energy-efficiency-related role know how to make that jump? They don't want to do an entire 4-year course. We need to make bridges and pathways clear ... Case study examples of career pathways could help: potential workers could see what kind of job a certain pathway would lead to. There is a particular issue here because these are new areas.

In relation to the electrical industry, EE-Oz emphasised that 'the industry needs to value [energy efficiency] skills and develop career pathways'. A major issue for the HVAC industry is the visibility of their profession and how this translates into generating interest in this sector as a career choice for school leavers. As AIRAH stated, 'School children wouldn't know about [the HVAC industry]. If you think about the traditional trades—plumbing, building, electricians etc.—they are highly visible. [The industry] is an aspect of life that people only really think about when it's not working'.

Skills Australia believes that the provision of a lifelong career and qualification ladder for apprentices and trainees is extremely important. It is essential that consideration be given to this issue in

69 Engineers Australia (2010), National registers, http://www.engineersaustralia.org.au/membership/national-registers/national_registers_home.cfm#reqs, accessed 12 October 2010.

70 National Engineering Registration Board (2010), Registration roadmap, <http://www.engineersaustralia.org.au/herb/registration-roadmap/introduction.cfm>, accessed 12 October 2010.

71 Council of Australian Governments (2009), *National strategy on energy efficiency*, p. 9.



the design of qualifications in the area of energy efficiency. It is equally important to ensure that pathways to career specialisation in this area are widely known and promoted in the industry. This will be a communication challenge for the industries themselves and the Industry Skills Councils which deal with their training needs.

Recommendation 3: Industry and the education and training system provide information on career pathways in energy efficiency.

It is recommended that industry and the education and training sector ensure that information is provided about career pathways in energy efficiency at trade, post-trade, degree and postgraduate level. This should be the responsibility of MCE and MCTEE.

2.6 Implications for the Education and Training Sector

Training needs in relation to energy efficiency have implications for all levels of the education and training sector.

A report by the National Centre for Vocational Education Research (NCVER) shows a 44 per cent increase in the number of NSW vocational students enrolled in one or more energy efficiency skills units of competency or modules from 2008 to 2009 (720 to 1,040).

Our interviewees drew attention to a complex series of impacts which need to be taken into account in policy development, relating to provider capacity, student demand, the training requirements of emerging technologies, problems with incorporating energy efficiency requirements across the board in VET and HE courses, and the current lack of research capability in relation to the thermal performance of buildings.

Rapidly changing technologies make prediction difficult, so it is essential for ISCs and providers to have sufficient intelligence to foresee coming technological advances and make provision for them in Training Packages. As EE-Oz pointed out, 'The sector has limited capacity to keep pace with changing technologies or to build industry partnerships. There is a lag issue. The next step is not known until it comes up, for example as technology changes.'

The GBCA compared the challenge of incorporating energy efficiency understanding across the board with a similar process that occurred in relation to occupational health and safety in the recent past. 'OHS used to be the preserve of specialists, but it is now embedded in all employee induction processes'. The need for so many occupations to have a sound understanding of energy flows within a building points to specific knowledge requirements in relation to energy efficiency. The Green Skills Agreement (GSA) aims to build the capacity and capability of the VET sector to provide skills for sustainability training, including energy efficiency. Achieving Objective 2 of the Agreement (upskilling VET practitioners to provide effective training and facilitation in skills for sustainability) will be critical to enabling energy efficiency knowledge and skills diffusion to key industries.

Our respondents drew attention to a lack of consensus about the kind and degree of knowledge required by various occupations. The GBCA was of the view that knowledge requirements 'largely depend on the profession but for example the Real Estate Institute and Facility Managers Association know that their members will need a broader basic level of understanding of energy efficiency and green skills in general'.

Within the building and construction industry the MBA identified a need for sustainability principles to be embedded in both higher education and vocational training across the various levels of professional, paraprofessionals and trades occupations to shift cultural paradigms across the industry. In their view, if sustainability training is provided largely through elective units then most of the industry will miss out.



Achieving critical mass was widely seen as a significant issue for providers wishing to break into the market for energy efficiency training. The CEPU commented that 'Critical mass comes back to the drivers. It's no use if the market isn't there'. At the postgraduate level, Suzanne Benn noted that 'student numbers in Masters courses have grown markedly'. However, the CEPU reported: 'RTOs have been running courses at Certificate IV level. They thought the takeup would be bigger and have had to cancel courses. Consumers are not as green as 12-18 months ago'. According to Val MacGregor, 'TAFEs are tending to ignore the "low-hanging fruit" of energy efficiency in favour of sustainability. At the same time, developing skills in energy efficiency isn't high on the list for universities and it would be better to work together with all providers contributing, for example to energy efficiency training for architects'. Short courses were seen as a solution to the problem of critical mass by several respondents and the GBCA saw value in employing 'a variety of training media' to 'help generate interest and accommodate a variety of needs that currently exist'.

Examples of state initiatives in education and training for energy efficiency include the following from NSW:

The NSW Energy Efficiency Training Program

The NSW Energy Efficiency Training Program (EETP) is a joint program of DECCW and the Department of Education and Communities (DEC) NSW.

The Program helps implement the State Plan commitment to increase participation in green skills training to five per cent of all publicly funded training by 2013, and supports the \$150 million Energy Efficiency Strategy which helps NSW households, business and government save energy and reduce greenhouse gas emissions.

Over four years, the \$20 million EETP will help build the knowledge and skills of key tradespeople and professionals to:

- support improved energy efficiency practices, products and services
- support the development of a low carbon society in NSW
- foster innovation, workforce development and sustainable business growth.

The Program has five elements:

1. Delivery of Vocational Education and Training (VET)
2. Higher Education Courses and Graduate Program
3. Professional Development for VET Trainers
4. Industry Partnership Projects
5. Research and Evaluation.

A report by the National Centre for Vocational Education Research (NCVER) shows a 44 per cent increase in the number of NSW vocational students enrolled in one or more energy efficiency skills units of competency or modules from 2008 to 2009 (720 to 1,040). NSW enrolments in energy efficiency units or modules accounted for 17 per cent of the national total in 2009.

Under element 2, the Program supports the development and delivery of higher education courses that can grow energy efficiency knowledge and practice. This includes work with universities and professional associations to ensure key sectors have access to professional development, as well as undergraduate and postgraduate courses in energy efficiency and renewable energy.

continued overleaf



The NSW Energy Efficiency Training Program (continued)

Target professions include:

- educators and trainers
- business managers and accountants
- engineers.

Following an Expression of Interest process in 2009, two NSW universities have been selected for funding to develop energy efficiency courses in engineering at undergraduate and postgraduate levels and for practising engineers through professional development.⁷²

Source: NSW Office of Environment and Heritage and DEC

2.6.1 Short courses in higher education and VET

Some respondents were of the view that students could be attracted by post-trade or postgraduate short courses and flexible delivery options. The CEPU noted that 'the Green Plumber course has been picked up by the US plumbing industry and many of their local councils'. However, the same respondent identified problems with short courses currently being offered by an employer association.

According to the MBA,

Participation in short courses can be motivated by the desire of people in existing trades to advertise a green speciality. For example, almost 1000 people nationally have undertaken the Green Living course for builders offered by the MBA, and it is envisaged that ultimately 25 per cent of builders will complete this course so that they can trade as a Green Living builder. In addition to the course itself, Green Living offers an annual conference, continuing professional development and sponsorship.

One important issue is how the topic of energy efficiency is perceived by students. Research conducted by ARIES on behalf of the former NSW Department of Environment, Climate Change and Water (now Office of Environment and Heritage) suggested that energy efficiency is not valued by students as a course component. According to Suzanne Benn, 'There was more a focus on climate change adaptation. Energy efficiency comes across as a narrow technical issue'.

2.6.2 The Vocational Education and Training (VET) sector

The VET-trained workforce has a significant role in relation to the uptake of new technologies:

VET sector trainees are able to influence energy efficient practices earlier than professional graduates such as architects and engineers. It takes a graduate architect or engineer a number of years before they can exercise independent control over the design and construction process which itself takes years, whereas trades can implement what they learn straight away in construction and the installation and maintenance of equipment. (David Hood)

Relevant Industry Skills Councils have been active in identifying Units of Competency and qualifications for energy efficiency. One example is the Certificate IV in Home Energy Assessment prepared by CPSISC in conjunction with the Department of Climate Change and Energy Efficiency (see section 2.1.1. above). Skill sets and qualifications have been included in the EE-Oz suite of Training Packages for the following:

- Smart Meters: design, development, installation, maintenance and grid connection
- Co-generation, Tri-generation and local generation

72 NSW Department of Environment, Climate Change and Water (2010), Energy efficiency training program, <http://www.environment.nsw.gov.au/sustainbus/greenskills/enefttraining2.htm>, accessed 13 October 2010.



- Use of natural refrigerants and the reclamation of synthetic refrigerants in air-conditioning and refrigeration systems
- Advanced energy efficient lighting design and installation.⁷³

Because occupations in energy assessment are currently divided in the VET sector between Training Packages in electro-technology and construction, it is hard to achieve continuity between the roles in relation to home, small commercial and larger commercial settings.⁷⁴

Capacity constraints are a critical issue. According to the MBA, 'Capacity constraints in relation to both capital and to the trainer workforce limit offerings of electives, while effective integration of sustainability into core units is still some way off. Electives will also not be taken up unless there is a perceived commercial return, leaving trades workers lacking fundamental sustainability skills'.

According to EE-Oz, 'One issue is that in assessing training capacity, RTOs may contract the same trainer who may then be counted several times over'. In the view of the MBA, 'the current reality is that there are only a handful of trainers nationally with the skills and experience to offer credible energy efficiency training, whether this is in Home Sustainability Assessment, green building or trades courses'.

A potentially fruitful approach to issues of VET capacity in relation to energy efficiency would be to provide competitive funding on a regional or cluster-based model. *Australian Workforce Futures* identifies 'a gap in industry-level initiatives that tackle institutional and systemic workforce development issues or can encourage collective industry initiatives or regional action' and notes that 'skill ecosystem or cluster-based styles of workforce development activity achieve buy-in from a broad range of stakeholders, including key employers and trade unions, business and skill development experts, researchers and regulators'.⁷⁵

An approach of this kind to developing VET capacity for training in energy efficiency skills would foster cooperation in developing and using training infrastructure and VET teacher capacity. It could be included in wider strategies for continuing professional development to enable the VET workforce to meet emerging industry need, and take its place in a wider program of incentives to encourage partnerships between VET and higher education institutions for joint curriculum development.

Recommendation 4: Competitive funding be provided through a regional or cluster-based model to develop VET capacity for energy efficiency

It is recommended that MCE and MCTEE make competitive funding available through a regional or cluster-based model to develop VET capacity for energy efficiency skills. This would enable groups of providers to share infrastructure and practitioners to work closely with technical experts, consultants and researchers to expand the curriculum in energy efficiency.⁷⁶ This should be coordinated under the Green Skills Agreement to up-skill VET practitioners in providing effective training and facilitation in skills for sustainability, including energy efficiency.

2.6.3 Higher Education (HE)

In the HE sphere, training in relation to energy efficiency can be offered in both undergraduate and postgraduate courses. Research by the Natural Edge Project has shown that energy efficiency is not currently on the agenda for many undergraduate engineering courses in Australia.⁷⁷

There was some debate among our respondents about whether it would be preferable for students to undertake specialist or generalist engineering degrees. Glenn Platt expressed a personal view that there are dangers in engineering degrees that are too specialised as they are less widely recognised and may therefore be less portable. Suzanne Benn, however, drew attention to the

⁷³ The ElectroComms and Energy Utilities Industry Skills Council (2010), *2010 Environmental scan*.

⁷⁴ This is the view of Caroline Alcorso, NSW Department of Education and Training.

⁷⁵ *Australian Workforce Futures*, pp. 52-53.

⁷⁶ See note 9.

⁷⁷ The Natural Edge Project (2008), *State of education for energy efficiency in Australian engineering education*, p. 7.



success of the undergraduate Environmental Engineering course at the University of NSW. Coca Cola Amatil employs graduates from this program as environmental and sustainability managers.

Offering energy efficiency courses as electives is one way around this problem, although it does not address the issue of incorporating a base level of knowledge across the board.

Specialised courses at Masters level are another option, as the following example from NSW demonstrates:

Masters-level programs in energy efficiency in NSW universities

The ARIES and Office of Environment and Heritage (formerly Department of Environment, Climate Change and Water) centre at Macquarie University has undertaken a substantial study of requirements for Masters-level programs in NSW universities in relation to energy efficiency, including market research.

Key findings of the study include:

- There are few programs/courses and a limited number of units/subjects currently available on the topics of energy efficiency and renewable energy; these tend to be dependent on the particular interests and expertise of individual university teaching and research units rather than on the emerging needs for professional work concerned with the many issues around energy efficiency and renewable energy.
- There is student demand for a unit/subject devoted to energy efficiency and renewable energy and which treats technical, environmental, economic and social aspects in a holistic and integrated manner.
- A number of units/subjects already include class activities (lectures and workshops) and assessment tasks on these issues. However these are two among many other environmental and sustainability issues that compete... for inclusion in environmental management and sustainable developments programs/course.
- In this context there are currently no explicit plans to develop a new unit/subject in energy efficiency and renewable energy due to resource constraints. Financial support would enable units/subjects to be developed but should take into account differences in the structure of courses.
- The report recommended that the Department consider providing funding for the development of new units/subjects and teaching resources on energy efficiency and renewable energy appropriate to their particular programs/courses in NSW universities with Environmental Management and Sustainable Development Masters Courses.⁷⁸

Following the completion of this report in early 2010, the Australian Government through the Department of Education, Employment and Workplace Relations, funded ARIES through the *Skills for the Carbon Challenge* initiative to develop a full teaching unit (non-accredited) on Energy Efficiency and Renewable Energy designed to be inserted across the higher education and VET sectors. The purpose of the unit is to provide students with the understanding, skills and capabilities to incorporate concerns of energy efficiency, energy effectiveness and renewable energy in their personal and working lives. The modular construction of the unit will allow teachers and lecturers to either utilise the

⁷⁸ The Australian Research Institute for Environment and Sustainability (2010), *Market research and needs analysis to determine whether additional units on energy efficiency and renewable energy are required within NSW university masters programs*, pp. 4-6.



content within existing courses, or to develop new short courses. The course and materials that have been developed are designed to be contemporary and flexible in application to ensure that topics are accessible to teachers/lecturers who may not have a strong content background in these areas.

The resources and teaching materials, which are being trialled at a number of sites in the VET and higher education sectors, will be made publically available in early 2011.⁷⁹

Val MacGregor expressed concern that the research environment in relation to energy efficiency is not ideal. For example, there is currently no research in Australia in relation to thermal performance of buildings.

Skills Australia supports actions at state and federal level to promote the development of skills related to energy efficiency in the HE sector and believes that consideration should be given to measures to improve Australia's research performance in the field of thermal performance.

Recommendation 5: The development of courses in energy efficiency at all levels be included under outcomes-based funding for universities

It is recommended that outcomes-based funding for universities include the development of programs and electives in energy efficiency at undergraduate and postgraduate level, including PhD scholarships in topics related to energy efficiency, for example the thermal performance of buildings.

2.7 Developing Business Skills

Facilities managers, environmental/sustainability managers and people in similar roles need training in how to develop a business case for energy efficiency to put to senior management.

Research has found that managers with higher energy efficiency skills operate their buildings more effectively than managers whose skills are not as high. This highlights the need for training at both VET and HE level,⁸⁰ which could include training for management occupations to improve technical understanding of energy efficiency.

The training sector will need to address the issue of developing a business case for energy efficiency in both the immediate and longer term. In the immediate term, the financial benefits of energy efficiency need to be promoted to convince businesses to explore their energy efficiency options. Short courses addressing the business case for energy efficiency will need to focus on emerging new technologies and technical knowledge, as well as financial modelling of the benefits, including training in how to analyse the current business structure and assess where savings can be made.

The Investa Property Group provides an example of what can be achieved through a focused, sustained effort in energy efficiency, combined with internal training courses across all roles in the organisation. Over seven years, Investa have reduced their energy consumption by 22 per cent through constant monitoring, research and innovation.⁸¹

79 ARIES has trialled this unit, including training resources, in a number of sites in the VET and Higher Education sectors in September and October 2010. The unit was completed in late 2010. The curriculum and teaching resources that are developed by ARIES for this project will be made publicly available.

80 The Warren Centre (2009), *Low energy high rise building research study: Final research survey report*, <http://sydney.edu.au/warrencentre/LEHR/LEHR%20Research%20Survey%20Report%20Ver%205.2.pdf> accessed 12 October 2010, p. 8.

81 Investa Property Group (2009), *Sustainability report 2009*, <http://www.investa.com.au/reports/2009/sustainability/report.html>, accessed 13 October 2010.



A solution for the longer term is to incorporate energy efficiency into existing training systems at both VET and HE levels. At the HE level, according to Suzanne Benn, energy considerations are now being included in the curriculum of leading business schools in the US such as Cornell, McGill, Stanford, Harvard, Minnesota and in Canada, York and Simon Fraser.

A number of states have already-existing programs to assist businesses in the area of sustainability and/or energy efficiency. These include the Business Sustainability Alliance in South Australia, the Sustainability Advantage and the Energy Efficiency for Small Business programs in NSW, and the ClimateSmart Business Service in Queensland.

Measure 1.1.1 of the NSEE provides for 'support to businesses to assist them in improving their energy efficiency and to make informed choices by regarding energy efficiency by addressing barriers'.⁸² Some of the key elements are addressed to small to medium enterprises and others are broader in their application.

Skills Australia supports the action under Measure 1.1.1 and suggests that this be extended to the provision of advice in building a business case for energy efficiency in enterprises, including through state and territory programs to assist small businesses in energy efficiency. This could be underpinned by accredited training, such as the Certificate IV in Business Sustainability Assessment.

At the same time, it is important that the Ministerial Council for Energy and MCTEE provide encouragement for courses at VET and HE level to incorporate training in the development of a business case at all levels. This could include, for example, the costs and benefits of improvements to the building shell, lighting and HVAC appliances.

Recommendation 6: Training in developing a business case for energy efficiency be incorporated into relevant tertiary courses

It is recommended that MCE and MCTEE encourage courses at VET and higher education level to incorporate training in the development of a business case for energy efficiency at all levels, informed by examination of comparable courses in North American universities and colleges.

⁸² Council of Australian Governments (2009), *National strategy on energy efficiency*, http://www.coag.gov.au/coag_meeting_outcomes/2009-07-02/docs/Energy_efficiency_measures_table.pdf, accessed 2 February 2011, p. 7.



Appendix A. Interview questions

1. What changes in the labour market do you expect to result from recent and upcoming policy changes in the area of energy efficiency? Similarly, what changes do you expect to result from new and emerging technologies? What are the key drivers?
2. What are the implications for occupations?
3. Are new occupations emerging? At what levels (professional, VET-trained, etc)?
4. Do you think new and emerging occupations in the area are being classified and recorded satisfactorily at present? Is industry clear about the classification of these new occupations?
5. What data is your organisation holding, or aware of, in relation to present and projected future employment levels in the industry? How reliable do you believe the projections to be?
6. What skills are associated with any new and emerging occupations? How many of these are new skills?
7. How will skilling requirements for the current workforce change as a result of policies in the area of energy efficiency?
8. What will be the implications for the Education and Training System, both VET and HE, for changes in occupations and changed skilling needs for the existing workforce?
9. How can the question of critical mass in demand for courses be addressed?
10. How well placed is the industry now to meet demand for jobs and skills in the area, immediately and in the medium (2-5 years) and longer term (15 years)? What are the key issues/barriers?
11. What further research would be required to fill gaps in data and information in relation to occupations and associated skills?
12. What other issues do you think are relevant to our research?



Appendix B. Key initiatives targeting energy efficiency

Broadly based national strategies

The National Greenhouse and Energy Reporting Act (Department of Climate Change and Energy Efficiency)

The *National Greenhouse and Energy Reporting Act 2007* (the NGER Act) introduced a single national framework for the reporting and dissemination of information about greenhouse gas emissions, greenhouse gas projects, and the energy use and production of corporations. A number of legislative instruments sit under the NGER Act, providing greater detail about corporations' obligations. The objectives of the NGER Act are to inform government policy formation and the Australian public, help meet Australia's international reporting obligations (e.g. Kyoto Protocol), assist Commonwealth, state and territory government programs and activities, and avoid the duplication of similar reporting requirements. Businesses emitting more than 25,000 tonnes of carbon dioxide equivalent, or consuming more than 25,000 megawatts of electricity or 2.5 million litres of fuel in a year, are required to report under the Act.

The National Strategy on Energy Efficiency (COAG 2009)

The National Strategy on Energy Efficiency (NSEE) incorporates and builds on measures already agreed by COAG and the Ministerial Council on Energy through the National Framework for Energy Efficiency (NFEE). NFEE focuses on demand-side energy efficiency, primarily in the residential, commercial and industrial sectors. It also considers energy use in energy conversion and addresses intermediaries who can influence energy efficiency choices, such as energy retailers, builders, financiers and appliance suppliers.

Key measures in the Strategy are framed around four key themes:

1. Assisting households and businesses to transition to a low-carbon future
Measures address:
 - Industry and business. Measures include supporting businesses to assist them to address barriers to improving their energy efficiency (including continuing the Energy Efficiency Opportunities program—see below).
 - Skills and training. One key element to support this transition is the development of a trained and fully engaged workforce to provide sufficient numbers of skilled people to achieve Australia's energy efficiency potential.
 - Advice and education
 - Data
2. Reducing impediments to the uptake of energy efficiency
Measures address:
 - Electricity markets
 - Appliances and equipment
 - Transport
3. Making buildings more energy efficient
Measures address:
 - Ensuring consistency in standard setting and performance assessment frameworks. Key elements include to review and increase minimum standards periodically, e.g. every three years, to increase the energy efficiency of new residential and commercial buildings and major renovations.



- The commercial building sector, including mandatory disclosure
 - The residential building sector, including mandatory disclosure.
4. Government working in partnership and leading the way.

Common to both commercial and residential buildings, and major renovations, under NSEE Measure 3.1.1, the minimum energy standards that will apply will be reviewed and increased periodically, for example every three years.

The National Energy Efficiency Skills Initiative (under the National Strategy on Energy Efficiency)

The National Energy Efficiency Skills Initiative, currently developed in draft form, has been developed as a set of recommended actions to assist in the implementation of COAG's commitment under the National Strategy on Energy Efficiency to build the requisite workforce knowledge and skills for a low carbon economy and the implementation of sustainability strategies. This initiative recognises that training is integral in building the workforce to meet the needs of a low carbon economy.

Energy Efficiency Opportunities program (Department of Resources, Energy and Tourism)

The Australian Government's Energy Efficiency Opportunities (EEO) program requires Australia's largest energy using corporations (using more than 0.5 petajoules of energy per year) from the mining, manufacturing, services and transport sectors to undertake a rigorous and comprehensive assessment of their energy use and identify and publicly report on cost-effective energy efficiency opportunities with up to a four year payback period. Industry guidelines and other capacity-building materials are available to help large energy-using businesses understand their obligations.⁸³ A mid-cycle review found evidence of 'greater rigour, structure and focus to participants' energy management systems and processes'. See also the Long Term Training Strategy which aimed to further identify the skills needed to undertake effective energy efficiency assessments (Appendix C).

HVAC High Efficiency Systems Strategy (under the National Strategy for Energy Efficiency)

The HVAC High Efficiency Systems Strategy (HESS) Implementation Committee aims to drive long-term improvements in the energy efficiency of HVAC systems through whole-of-life improvements in HVAC efficiency, encompassing design, manufacture, installation, operation and maintenance. A large part of the gains targeted are in the maintenance and operation of existing systems in existing buildings, and through the establishment of national standard systems of documentation of the design, installation, operation and maintenance of the equipment.

Minimum Energy Performance Standards (MEPS) (Department of Climate Change and Energy Efficiency)

It is mandatory for certain products manufactured in or imported into Australia to meet the MEPS levels specified in the relevant Australian standards. MEPS programs are made mandatory in Australia by state government legislation and regulations which give force to the relevant Australian standards.⁸⁴ Standards for lighting, in particular, have skills and training implications for the built environment.

Greenlight Australia (under the National Framework for Energy Efficiency)

Lighting is responsible for about a third of the greenhouse emissions from the commercial sector, and is a significant contributor to both residential and industrial sector emissions. Greenlight Australia is a strategy for improving the efficiency of lighting in Australia 2005-2015 and is the outcome of consultations with stakeholders in both Australia and New Zealand. Mandatory

⁸³ See www.energyefficiencyopportunities.gov.au

⁸⁴ *Minimum Energy Performance Standards (MEPS) Regulations in Australia – Overview*, <http://www.energyrating.gov.au/meps1.html>, accessed 24 January 2011.



measures under the Greenlight Australia Strategy include Minimum Energy Performance Standards (MEPS) and energy efficiency labelling/information disclosure.⁸⁵

Review of the energy audit standard (under the National Framework for Energy Efficiency)

A review of the energy audit standard ASNZ3598 2000 is currently underway under the auspices of the NFEF. This standard sets out minimum requirements for both commissioning and conducting energy audits which identify opportunities for energy efficiency improvements. The current standard has some weaknesses and is under-used. A revised standard could play a role in increasing the number and quality of energy audits and assessments being undertaken in Australian commercial buildings. The new standard may also be used to underpin an accreditation system for energy auditing and assessment, and form the basis for industry training.

The National Australian Built Environment Rating System (managed by NSW Office of Environment and Heritage)

The National Australian Built Environment Rating System (NABERS) is a performance-based rating system for existing buildings. It rates a building on the basis of its measured operational impacts on the environment. NABERS is a national initiative managed by the NSW Office of Environment and Heritage. NABERS is a voluntary initiative designed to provide a simple indication of how buildings are managing environmental impacts compared to their peers and neighbours. Government tenants are now required to occupy only buildings with a NABERS rating of 4.5 or higher. A NABERS Energy Rating will be required under the Mandatory Disclosure of Commercial Office Building Energy Efficiency (Commercial Building Disclosure).

Energy Efficiency in Government Operations (Department of Climate Change and Energy Efficiency)

The Energy Efficiency in Government Operations (EEGO) policy forms part of the Australian Government's climate change strategy. *Energy Efficiency in Government Operations* aims to improve energy efficiency, and consequently reduce the whole of life cost and environmental impact of Government operations.

The policy comprises three major elements:

- Annual reporting of energy performance by agencies
- Portfolio energy intensity targets by 2011
- Minimum energy performance standards for office buildings, appliances, vehicles.

Building Code of Australia (Australian Building Codes Board)

Section J of the BCA 2010 contained enhanced energy efficiency measures. The code required that all new houses should be built to a six-star energy efficiency rating equivalence and apartments must have an average rating of six-stars or equivalent. From May 1 2011 the Building Code of Australia has been replaced by the National Construction Code, which consolidates codes from the building and plumbing industries.

CitySwitch Green Office (a partnership program)

CitySwitch Green Office is a national tenant energy efficiency program run in partnership between the cities of Sydney, North Sydney, Parramatta, Willoughby, Canberra, Brisbane, Adelaide, Melbourne and Perth along with state government agencies, the NSW Office of Environment and Heritage and Sustainability Victoria.

With a geographical reach representing approximately 70 per cent of Australia's office space, the program works with tenants to improve office energy efficiency, thereby reducing the CO₂ emissions that contribute to global warming. One of the main reasons for choosing this way to bring

⁸⁵ Greenlight Australia: A strategy for improving the efficiency of lighting in Australia 2005-2015 (2004), <http://www.energyrating.gov.au/library/pubs/200418-greenlight.pdf>, accessed 9 November 2010, p. 9.



about environmental action, is that tenants can influence up to 50 per cent of total energy use in office buildings.⁸⁶

National initiatives specifically targeting the commercial building sector

Mandatory Disclosure of Commercial Office Building Energy Efficiency (Commercial Building Disclosure) (Department of Climate Change and Energy Efficiency)

Federal, state and territory government energy ministers approved the parameters of the new disclosure scheme for office building energy efficiency in November 2009. Phase one involves disclosure for large commercial office buildings (2,000 square metres or larger). Phase two involves consideration of expanding disclosure to other commercial building types, including hotels, retail buildings, schools and hospitals. Any extension to these buildings would be subject to further analysis of the impact. The *Building Energy Efficiency Disclosure Act 2010* commenced on 1 July 2010 and is being implemented through the Commercial Building Disclosure program. The requirement to disclose information commenced on 1 November 2010.

In From the Cold (Department of Climate Change and Energy Efficiency)

The aim of 'In from the Cold' is to improve the energy performance and uptake of energy efficient non domestic refrigeration products and services within Australia and New Zealand, and stimulate the development of an internationally competitive industry serving local and overseas markets. In from the Cold identifies the priority refrigeration technologies and market sectors to be targeted over the next ten years that will make a significant improvement to the energy performance of products and services throughout the non domestic refrigeration sector. This will be achieved through measures which encourage the improved design and installation of new refrigeration equipment and systems, together with better maintenance practices to ensure that savings endure. The strategy includes a range of policy measures, including the provision of information, voluntary and regulatory initiatives, designed to break down the barriers which currently prevent optimal energy efficiency. Fully implemented, these measures are expected to reduce electricity consumption from non domestic refrigeration by 3,300 GWh in 2020, and by 8,000 GWh in 2030.

The Green Building Fund (Department of Innovation, Industry, Science and Research)

The Green Building Fund aims to reduce the impact of Australia's built environment on greenhouse gas emissions, by reducing the energy consumed in the operation of existing commercial office buildings. The program runs across five years, from 2008-09 to 2012-13 and has already contributed to increasing energy efficiency for various projects through the upgrading of equipment such as lighting, heating, ventilation, cooling and monitoring equipment. Round 6 of the Green Building Fund closed on 27 April 2010 and no further funding rounds are planned.

Green Lease Schedule (Department of Climate Change and Energy Efficiency)

The Green Lease Schedule (GLS), a key component of Energy Efficiency in Government Operations (EEGO), is a new type of leasing arrangement developed by the Department of Sustainability, Environment, Water, Population and Communities and the Australian Government Solicitor (AGS) for government agencies. It contains mutual obligations for tenants and owners of office buildings to achieve efficiency targets. The GLS improves energy efficiency by setting a minimum ongoing operational building energy performance standard. The standard used is the Australian Building Greenhouse Rating (ABGR).

⁸⁶ CitySwitch green office, <http://www.cityswitch.net.au/>, accessed 9 November 2010.



National initiatives specifically targeting the residential building sector

Residential Building Mandatory Disclosure (not yet in effect) (under the National Strategy for Energy Efficiency)

Under the National Strategy for Energy Efficiency, Commonwealth and state and territory governments have proposed to introduce compulsory disclosure of residential building performance information when selling and leasing homes. If adopted, this may require owners of existing homes to assess and rate their home's energy, water and greenhouse performance and provide the information when selling or leasing. A number of states and territories such as the ACT and Queensland have already implemented some kind of compulsory rating system for homes.

The Nationwide House Energy Rating Scheme (Department of Climate Change and Energy Efficiency)

The Nationwide House Energy Rating Scheme (NatHERS) is an initiative of the Ministerial Council on Energy, administered by the Energy Efficiency Working Group and managed by the Department of Climate Change and Energy Efficiency. NatHERS provides a framework that allows various computer software tools to rate the potential energy efficiency of Australian homes. NatHERS facilitates consistent and repeatable ratings irrespective of the commercial software tool selected, and ensures that homes in all regions are treated fairly in their rating. NatHERS enables homes of good practice for each local climate to receive a similar rating, even though each building will be subject to widely different climatic conditions.

Phase-out of electric hot water systems (Department of Climate Change and Energy Efficiency)

The Commonwealth, state and territory governments have been working together from 2010 to phase out greenhouse intensive hot water systems. Electric hot water systems are 2.5 times less efficient than other technologies available. This phase-out will result in the reduction of greenhouse gases by about 30 million tonnes over ten years from 2010-2020.

The Green Star Rating System (Green Building Council of Australia)

The Green Building Council of Australia has developed the Green Star rating system for the property industry. Green Star is a comprehensive, national, voluntary environmental rating system that evaluates the environmental design and construction of buildings in a holistic manner, as opposed to the NABERS Energy tool which measures the performance of the building. Green Star covers a number of categories assessing the environmental impacts that are a direct consequence of a project's site selection, design, construction and maintenance. The nine categories included within all Green Star rating tools are Management, Indoor Environment Quality, Energy, Transport, Water, Materials, Land Use & Ecology, Emissions, and Innovation. Although Green Star is a voluntary system, 11 per cent of Australia's CBD commercial office buildings are currently Green Star certified. (GBCA)

State and territory initiatives

ACT Government

Home Energy Advice Team (HEAT)⁸⁷—HEAT can provide home energy audits at a cost of \$30 each and homeowners who spend at least \$2000 on energy efficiency improvements identified during the audit will be eligible to receive a \$500 rebate from the ACT Government, plus a refund of the \$30 audit fee.

87 ACT Government (2010), Home Energy Advice Team, http://www.heat.net.au/subsidies_rebates, accessed 30 September 2010.



Energy Efficiency for House Sales⁸⁸—For homeowners who are about to sell a dwelling they occupy or that has been occupied or rented to tenants, the current level of energy performance has to be disclosed to the prospective purchasers.

Tune up Canberra⁸⁹—This initiative is a \$2 million grants program that offers financial incentives to encourage owners of commercial office buildings to make their buildings more energy and water efficient. Grants will be matched by the ACT government dollar for dollar up to certain thresholds.

NSW Government⁹⁰

NSW Energy Efficiency Strategy⁹¹—measures under the Strategy include:

- **The NSW Energy Savings Scheme (ESS)**—This white certificate scheme requires electricity retailers to save energy by improving energy efficiency in households and businesses. The energy savings target when the Scheme started on 1 July 2009 was 0.4 per cent of electricity sales in NSW and this will increase to 4 per cent of electricity sales in NSW by 2014.
- **Home Power Savings Program**—The \$63 million Home Power Savings Program is providing free home power assessments and power savings kits to 220,000 low-income families. It is estimated that this program will help participating households save up to 20 per cent of their energy use every year.
- **Energy Efficiency Training Program**—The \$20 million Energy Efficiency Training Program is a four year program to build energy efficiency skills in the NSW workforce. See details in section 2.6 above.
- **Energy Efficiency For Small Business Program**—The \$15 million Energy Efficiency for Small Business Program is providing advice and rebates to help 6,000 small and medium-sized businesses cut energy use, saving the average small business \$7,850 on electricity bills over 10 years.
- **Energy Saver**—Energy Efficiency for Medium to Large Organisations—The Office of Environment and Heritage provides subsidised energy audits and facilitation to help NSW businesses identify and implement energy savings.
- **Energy Efficiency Community Awareness Program**—This \$15 million program provides practical advice on saving energy at home and work.
- **Public Sector Energy Savings**—The NSW Government Sustainability Policy requires public sector agencies to reduce their energy consumption and includes a target to reduce energy use in government-owned or tenanted buildings to year 2000 levels by 2019-20.

The Building Sustainability Index (BASIX)⁹²—BASIX is an on-line program that assesses a house or unit design, and compares it against energy and water reduction targets. The design must meet these targets before a BASIX Certificate can be printed. Every development application for a new home must be submitted to Council with a BASIX Certificate.

Northern Territory Government

Energy Smart Rebate NT⁹³—The Northern Territory government is providing households with a rebate of 50 per cent up to \$200 after purchasing selected energy savings devices. The rebate expires 30 June 2011.

EcoBiz NT⁹⁴—Northern Territory businesses who undertake a site survey of their environmental efficiency are eligible for a grant of 50 per cent up to \$20,000 to assist in implementing environmentally efficient improvements.

88 ACT Planning and Land Authority (2010), Energy Efficiency for House Sales, http://www.actpla.act.gov.au/topics/property_purchases/sales/energy_efficiency, accessed 30 September 2010.

89 ACT Planning and Land Authority (2010), Tune up Canberra, http://www.actpla.act.gov.au/topics/design_build/regulation2/tune_up_canberra, accessed 8 November 2010.

90 Material on NSW energy efficiency programs was provided prior to the March 2011 election.

91 NSW energy efficiency strategy, <http://www.environment.nsw.gov.au/climatechange/energyefficiencystrategy.htm>, accessed 16 November 2010.

92 NSW Government, BASIX, http://www.basix.nsw.gov.au/information/common/pdf/basix_fact_sheet.pdf, accessed 16 November 2010.

93 Northern Territory Government (2010), Energy Smart Rebate NT, <http://www.greeningnt.nt.gov.au/climate/energy.html>, accessed 8 November 2010.

94 Northern Territory Government (2010), ecoBiz NT, <http://www.nt.gov.au/dbe/ecobiznt/index.shtml>, accessed 8 November 2010.



Going Green⁹⁵—This initiative provides advice and steps for Northern Territory tourism businesses to become environmentally efficient in using their resources to maintain a competitive advantage for the sustainability of the Territory’s tourism industry.

EnvironmeNT Grants⁹⁶—This Northern Territory Government initiative is provided for on-the-ground actions to help reduce impact on the environment and ensure the Territory’s unique and beautiful environment is safeguarded for everyone to enjoy.

Over the past six years this program has provided over \$3 million to fund a diverse range of projects across the Territory. This program includes energy efficiency in its scope.

Queensland Government

Government energy efficiency initiatives⁹⁷—Initiatives relevant to the built environment include:

- The Department of Public Works’ (DPW) Energy Smart Buildings Program—to support the implementation of the Strategic Energy Efficiency Policy for Queensland Government Buildings and the Carbon Reduction Strategy for Government-owned office buildings. These policies clearly articulate the roles and reporting responsibilities of individual departments.
- Energy Efficiency Retrofit Program
- Solar and Energy Efficiency in State Schools program
- Auditing of government owned social housing and associated energy efficiency improvements
- Queensland Health’s Eco efficiency program
- Queensland Corrective Services (QCS): Probation and Parole Green Workplaces Strategy—to reduce the carbon footprint of operations by reducing energy, water and waste. Queensland Corrective Services facilities are also improving environmental efficiency through a range of activities.⁹⁸
- Department of Education Ecologically Sustainable Development Design Requirements for State Schools.

Initiatives to support household and community energy efficiency include:

- ClimateSmart Living Program—incorporates the ClimateSmart Home Service targeting 260,000 homes state wide.⁹⁹
- Energy Conservation Communities—Government-owned energy distribution entity ENERGEX is working with local authorities in SE-Qld to promote awareness of electricity peak demand and energy conservation.¹⁰⁰
- Actions addressing energy efficiency under the *South East Queensland Regional Plan 2009-2031*.
- The Cool Change/Energy Smart Suburbs Trial—to help manage demand for electricity by installing demand-responsive devices on household air conditioners and/or swimming pools. (Note that this initiative is managed by ENERGEX).
- Amendments to Building Codes:
 - 6-star (out of 10) energy ratings for new and renovated houses
 - Ban on importation of inefficient light bulbs, to ensure installation of CFLs that use 80 per cent less electricity.
 - Ban on the sale and installation of inefficient air conditioners
 - Electricity sub-metering.

95 Tourism NT, Going Green, <http://www.tourismnt.com.au/industry-resources/going-green.aspx>, accessed 8 November 2010.

96 Northern Territory Government (2010), EnvironmeNT Grants, <http://www.nt.gov.au/nreta/environment/grants/index.html>, accessed 19 November 2010.

97 Energy efficiency: Queensland’s first energy resource, <http://www.parliament.qld.gov.au/view/committees/documents/ERC/reports/ERC002.pdf>, accessed 15 November 2010.

98 See: http://www.correctiveservices.qld.gov.au/About_Us/The_Department/Key_Initiatives/Green_Corrections/index.shtml.

99 See: <http://www.climatesmart.qld.gov.au/>.

100 See: <http://www.energycc.com.au/>.



Initiatives to support commercial and industrial energy efficiency include:

- The ecoBiz Program—to help businesses reduce energy, water, waste and materials wastage.
- ClimateSmart Retail.
- ClimateSmart Business Clusters.
- The Queensland Water and Energy Sustainable Technology Network.
- The Smart Energy Savings Program—to reduce the energy consumption of organisations that consume between 100 terajoules (TJ) and 500 TJ per annum (in 2009-10) by requiring businesses to undertake an energy audit and develop an Energy Savings Plan.

South Australian Government

Energy Partners—Energy Partners works in partnership with community based organisations across SA to educate, motivate and empower South Australians to apply sound residential energy practices. The program offers residential energy efficiency support and assistance to organisations, in return for commitments to pass on the information and support to clients/customers. The program assists non-commercial organisations with a wide range of clients/customers. It has a particular focus on assisting organisations in touch with low income/disadvantaged households, because these households are disproportionately affected by rising energy prices.

Energy Efficiency requirements for new homes and commercial premises—Increased energy efficiency requirements for all new dwellings built in South Australia came into effect on Wednesday 1 September 2010. The new '6-star' energy efficiency requirement – which also applies to alterations or additions to existing homes – replaces the previous 5-star energy efficiency.

The Building Innovation Fund—The \$2 million Building Innovation Fund aims to establish South Australia as the nation's leader in demonstrating innovative ways to reduce the carbon footprint of existing commercial buildings. The Fund offers grants to owners of commercial buildings for initiatives that demonstrate new and leading edge approaches to retrofitting existing buildings and which significantly reduce building energy use and greenhouse gas emissions.

Home Energy Toolkit—The home energy toolkit is a collection of tools and information designed by the Energy Division to assist householders in performing their own home energy audit. There are 53 public libraries that currently have a Home Energy Toolkit available for loan.

South Australian Government Building Energy Efficiency—South Australia's Strategic Plan includes a target to improve the energy efficiency of government buildings by 25 per cent from 2000-01 levels by 2014. The Department for Transport, Energy and Infrastructure co-chairs with the Department for Premier and Cabinet the Energy Efficiency Reference Group (EERG), which oversees implementation of the target. Each year an Annual Energy Efficiency Report is produced detailing progress toward the target and actions that Government agencies are taking to improve energy efficiency.

Tasmanian Government

State based initiatives include:

- **Earn Your Stars Micro-grants program**—grants of up to \$3000 to eligible community groups to find and implement local solutions to the challenges of climate change.
- **Climate Connect Grants program**—up to \$30,000 to support projects to help communities identify and implement solutions to reduce greenhouse gas emissions and/or conserve energy to meet the challenges of climate change.
- **The Bass Strait Islands Energy Project**—an initiative of \$350,000 to assist King and Flinders Islands residents to improve their energy efficiency and reduce their energy costs.
- **The CleanBiz Tasmania program**—a facilitation service to assist businesses improve their sustainability outcomes.



The Hobart City Council has implemented three rebate schemes to encourage residents to adopt energy efficient options. The first is the Solar and Heat Pump Hot Water Rebate¹⁰¹ which offers ratepayers a \$500 incentive to install energy efficient solar or heat pump hot water systems until 31 December 2011. The second rebate is the Energy Efficient Development Rebate¹⁰² for new buildings or additions that meet a set of energy efficient criteria such as building orientation. The third rebate is a 30 per cent Insulation Rebate for landlords installing ceiling insulation into their rental properties, built prior to 1991, up to a maximum rebate of \$300.¹⁰³

Victorian Government

Energy efficiency measures introduced by the previous Victorian government no longer represent government policy. The policies of the new government in relation to energy efficiency have not been announced in time for inclusion in this report.

Western Australian Government

Energy Smart Business (ESB) Program—The program aims to encourage best practice energy management and use the of sustainable energy technologies in Western Australian businesses. Central to the delivery of the business program are a number of tools and information resources.

Residential Buildings Program—The aim of this program is to promote and educate the wider community on the concepts and potential for energy savings in the home. This includes an examination of insulation, shading, thermal mass, windows/ventilation and house orientation.

Energy Smart Government (ESG) Program—The aim of this program is to develop and implement strategies and programs that enable government agencies to reduce energy use and meet energy reduction targets. ESG aims to reduce the cost and environmental impact of Government operations through improved energy efficiency. Agencies are also required to report their total energy costs, consumption, greenhouse gas emissions and key performance indicator data each year. The Energy Smart Government policy covers all stationary energy used in buildings, plant and equipment by participating State public sector agencies.

Energy Smart Community Program—The objective of the Energy Smart Community program is to increase the uptake of energy efficiency and renewable energy by Western Australian households by:

- providing access to information on the different ways to save energy in the home
- implementing public communication and educational campaigns aimed at increasing the uptake of renewable energy and energy efficiency within the WA community
- promoting the use of small scale renewable energy systems for suitable applications to meet the energy needs of WA households and communities.

Hardship Efficiency Program (HEP)—This program assists customers in hardship to increase energy-efficiency within their home through a combination of energy saving tips and education and appliance upgrades. The program aims to help ease financial pressures on people who find it difficult to pay their household electricity bills.

Low Emissions Energy Development Fund (LEED)—This fund is operated by the Department of Environment and Conservation (DEC) and supports the technological development in both renewable energy and energy efficiency. The Fund will invest a total of \$30 million in technologies which are suited to the West Australian environment, including geothermal, bioenergy, wind, wave, tidal and solar. Projects which have received funding thus far include an algal fuel demonstration facility near Karratha and a commercial geothermal demonstration project at UWA.

101 Hobart City Council (2010), Solar and heat pump hot water rebate, http://www.hobartcity.com.au/content/InternetWebsite/Environment/Energy_Efficiency_Guidelines_and_Incentives/Solar_and_Heat_Pump_Hot_Water_Rebate.aspx, accessed 12 October 2010.

102 Hobart City Council (2010), Energy efficient development rebate, http://www.hobartcity.com.au/content/InternetWebsite/Environment/Energy_Efficiency_Guidelines_and_Incentives/Energy_Efficient_Development_Rebate.aspx, accessed 12 October 2010.

103 Hobart City Council (2010), Insulation rebate, http://www.hobartcity.com.au/content/InternetWebsite/Environment/Energy_Efficiency_Guidelines_and_Incentives/Insulation_Rebate.aspx, accessed 12 October 2010.



Appendix C. Workforce development activities in energy efficiency in Australia: some examples

The Long Term Training Strategy for the Development of Energy Efficiency Assessment Skills (LTTS)

As part of the National Framework for Energy Efficiency (NFEE), the Department of Resources, Energy and Tourism conducted research towards a long term training strategy that would address the capacity and capability of industry to undertake rigorous energy efficiency assessments. The research was primarily based on the assessment requirements of the EEO program. Research methodology included consultation with a range of large energy using corporations in the mining, manufacturing, transport, commercial services and energy services sectors, as well as professional associations and government. The 'Commercial, retail and services' sector was included in this research; however, findings highlighted in this report and below reflect input from all sectors.

- The research identified skills gaps in:
 - Energy analysis skills like energy mass balance, thermodynamics of energy, whole of systems analysis and cross-team skills
 - Ability to develop and present a business case to engage senior decision makers for energy efficiency projects
 - Installation and use of metering and monitoring equipment to provide meaningful real time information
 - Ability to integrate energy efficiency findings into cross business operational plans and practices.
- Industry entities are drawing on Energy Services Providers to help address internal skills gaps and shortages.
- One concern is that where there are personnel with the skills to conduct assessments, they lack industry experience.
- Both industry and Energy Services Providers report that learning-on-the-job has been a significant method of skills development. Industry values government workshops highly as a method for acquiring new skills.
- Currently there is no one course or Training Package covering all the functional skills needed to conduct an energy efficiency assessment. One of our interviewees points out, however, that 'this depends on how an energy efficiency assessment is defined, the identification of 'functional skills' and the scale of an assessment'. (EE-Oz)
- Industry and Energy Services Providers are reporting that they supplement the energy efficiency specific skills training offered in universities and the VET sector with in-house training and skills development on the job.
- It is likely that many industry and Energy Services Providers will address knowledge gaps through non-accredited government and industry association workshops in the short term.

Key findings from this research have been published in the document *Functional skills for an energy efficiency assessment* (see http://www.ret.gov.au/energy/Documents/eex/FunctionalSkills_final.pdf).



The Queensland Sustainable Energy Skills Formation Strategy

The Queensland Energy Efficiency Industry Leaders Group (QEEILG) was established to address workforce planning and development issues within the energy efficient built environment industry. Its role is to provide effective advocacy for the industry and strategic direction to the Sustainable Energy Skills Formation Strategy which is a Queensland Department of Education and Training initiative. The QEEILG's Industry Action Plan identifies four key areas to address workforce issues confronting the industry: Government Policy; Industry Profile; Licensing and Accreditation; and Education and Training. Under each of these four key areas, the Industry Action Plan outlines specific actions and the desired outcomes of each action.

Actions relating to workforce development include to:

- Develop accurate definitions of industry occupations such as Renewable Energy Consultant, Energy Auditor and Sustainability Assessor so they can be adopted by industry and more effectively linked to education and training. QEEILG are examining the issue of ambiguous definitions of industry occupations and considered debate around whether there are in fact new occupations or whether they are simply new roles for workers within existing trades and professions.
- Identify occupational pathways for new entrants who do not have an existing trade or professional qualification.
- Facilitate closer relationships between unions within the sector, particularly in relation to skills convergence.
- Engage with Engineering associations to explore higher-level energy management and renewable energy qualifications and to develop a CPD curriculum.
- Secure funding to train existing industry workers as trainers and provide appropriate professional development pathways for them.¹⁰⁴
- Ensure sector wide engagement and collaboration of all relevant Industry Skills Councils to ensure a holistic and multidisciplinary approach to education and training.¹⁰⁵

Your Home (Department of Climate Change and Energy Efficiency)

Your Home is a joint initiative of the Australian Government and the design and construction industries. It provides a suite of consumer and technical guide materials and tools developed for residential buildings.

The Your Home Technical Manual provides information for designers and builders on how to design, construct or renovate more environmentally sustainable homes. It is a technical education resource which has been used as a basis for industry training.¹⁰⁶

¹⁰⁴ Funding under the Productivity Places Program has been used in Queensland to train trades workers wishing to move into less physically demanding career roles in the Certificate IV in Training and Assessment and match them up with Registered Training Organisations experiencing difficulties in recruiting trainers.

¹⁰⁵ Queensland Energy Efficiency Industry Leaders Group (2010), Industry action plan, <http://qeeilg.com/phocadownload/Documents/qeeilg%20industry%20action%20plan.pdf>, accessed 13 October 2010.

¹⁰⁶ Your Home – Design for lifestyle and the future, <http://www.yourhome.gov.au/about/index.html>, accessed 18 April 2011..



Appendix D. Occupational case studies

Building scientist

Historically, energy efficiency was entirely driven by cost/benefit analyses based on energy savings. In the last decade, according to Paul Bannister, two key changes have impacted the profession: the price of energy has gone up considerably, and people have become increasingly aware of climate change and the role that energy consumption plays in greenhouse emissions. This has prompted activity from the large corporate sector seeking to improve their corporate environmental profile. A third factor has been the success of building rating systems, particularly NABERS, in the office building market. This has created a significant link between greenhouse performance and the ability to let buildings, leading in turn to a large volume of energy efficiency work with the economic rationale being rental potential rather than energy savings.

The work involves two basic technological categories. The first, 'retro-commissioning', is in effect the tuning of building operation to improve building performance mostly through the optimisation of air-conditioning controls. The second category, retrofitting, is the replacement of older, inefficient technologies with newer, more efficient and/or better designed technologies. This may include: the replacement of key items of plant such as chillers; redesign of systems to avoid or limit inefficiency, particularly in periods of low load; or lighting upgrades.

As has always been the case, this work requires, first and foremost, strong analytical and problem solving skills. However the required level of technical knowledge in terms of building systems and operation has increased markedly in recent years. According to Paul Bannister, those with traditional engineering degrees often seem to operate at a disadvantage compared to those that have gone through more problem recognition/solution based education. This is possibly related to the fact that at present there is no dedicated building services degree in Australia with the result that building services knowledge has to be obtained on the job under the pressure of immediate outcomes, which tends to detract from the ability to analyse the underlying problems and synthesise design issues critically.

In Paul Bannister's view, there is a desperate shortage of skills in the retro-commissioning market. However training a workforce to meet this need is difficult and slow because retro-commissioning requires a very strong systems-based understanding of how buildings work. Paul Bannister's experience suggests that this is a field which people can be trained into from graduation with reasonable success but that diversion into this field at later ages is very difficult. This makes the process of training extremely slow, as it takes five years to get the best staff from graduate level to being able to provide leadership to new staff. This severely limits the growth rate in the industry in the short to medium term. Improvement is likely in the longer term but in Paul's view there will be severe constraints on the upper levels of the industry skill base for a long time to come.

Paul believes that there is a need to develop and promulgate compartmentalised technology training courses, preferably with an assessment framework, directed at the vocational training market. This would allow graduates to gain specific skills in relation to specific technologies over a period of time. Presently there are a number of courses that go some way in this direction but none that really provide the necessary depth. The systems thinking aspect could be developed as a higher level training module. Some of this needs to be oriented around getting people to understand the interaction of building system components through the use of computer simulation techniques, while some needs to be based on teaching the principles of how control systems work.

Source: Paul Bannister, Exergy Australia



Instrumentation electrician

The demand for instrumentation electricians at trade, post-trade and para-professional levels has rapidly expanded as a result of continued expansion in the resources sector, increased automation in industry and expansion of the integration of control systems into commercial/domestic installations.

Systems based on integrated Supervisory Control and Data Acquisition (SCADA) technologies, high speed data networks and distributive control systems, requiring data interpretation skills, are being routinely deployed. This convergence of electrical systems with ICT based control systems is requiring the electrical instrumentation tradesperson to have high level, cross-discipline trade skills supported by ICT skills.

According to EE-Oz, ongoing technology improvement will be a major factor in achieving energy efficiency whilst increasing productivity and maintaining economic growth. Automation, measurement, data capture and analysis and process control are key tools for Australian industry to achieve these goals. Thus the importance of the skills to install, integrate, maintain and monitor electrical/electronic systems to industry cannot be understated.

The application of instrumentation skills, particularly in control, systems integration and measurement, will underpin the successful implementation policy responses to the need for energy efficiency and the introduction of carbon pollution reduction strategies.

EE-Oz has recently restructured Post-Trade qualifications in the Instrumentation, Industrial Control–Industrial Electronics disciplines to reflect the changing nature of this sector, including:

- UEE40410 Certificate IV in Electrical–Instrumentation
- UEE40910 Certificate IV in Industrial Electronics and Control
- UEE42210 Certificate IV in Instrumentation and Control
- UEE42410 Certificate IV in Hazardous areas–Industrial control
- UEE50210 Diploma of Electrical and Instrumentation
- UEE50910 Diploma of Industrial Electronics and Control Engineering
- UEE51010 Diploma of Instrumentation and Control Engineering
- UEE61410 Advanced Diploma of Engineering–Explosion protection–Industrial control
- UEE61510 Advanced Diploma of Instrumentation and Control Engineering

UEE60610 Advanced Diploma of Industrial Electronics and Control Engineering

Industry is also reviewing competencies in this discipline and re-aligning these to reflect emerging technologies and work practices.

The ISC is also engaging with Original Equipment Manufacturers (OEMs) and equipment vendors who provide specific training to industry to capture the value of this training and map it to new and/or existing competencies. This will allow industry operatives to have this training recognised within the national training system, adding to the portability and currency of skills. Industry believes that the value added to the economy's skills base by vendor training warrants a significant mapping effort to capture the full and ongoing value of training which has been largely unmeasured.

According to EE-Oz, there has been traditional employer resistance to higher level para-professional qualifications in this sector, with industry preferring to seek operatives with dual trade (Australian Qualifications Framework 3) qualifications rather than train or employ those with Diploma level and higher qualifications. However, there remains broad industry support for the continued incorporation of trade skills at AQF levels 5 and 6 and a belief that these skill levels are appropriate to the current and future demands for skill electrical instrumentation personnel. The restructure of qualifications and mapping of vendor training are essential steps in encouraging industry confidence in higher level qualifications.

EE-Oz also finds that training in these skills is under constant threat from the chronic lack of skilled and experienced technical trainers/teachers to provide training and mentoring for apprentices entering this discipline. This is further exacerbated by the competition for skills within the economy.



In the current environment, the demand for instrumentation electricians/technicians to meet industry's need for measurement, monitoring and systems improvement in response to programs such as Energy Efficiency Opportunities and mandatory reporting requirements will become more pronounced as the parameters for business types and sizes captured by mandatory and/or industry energy efficiency programs broaden. Outside of regulatory drivers, potential cost benefits accruing from energy efficiency gains will also propel industry demand for instrumentation skills.

In the medium term, EE-Oz believes that current shortages will become critical due to these factors and the expected spike in the demand for electrical instrumentation/industrial control tradespeople which the introduction of an emissions trading scheme will bring.

Current skills demand and shortages in this discipline are unlikely to be addressed in the short to medium term, without significant interventions. Demand driven programs such the Enterprise Based Productivity Places Program (EBPPP), which give industry flexibility in how they train, offer real opportunities to address chronic skill shortages. According to EE-Oz, both government and industry must recognise that the long term resolution of shortages of skilled personnel in this sector requires significant investment over time and must ensure that short-term, supply-driven approaches are not preferred.

Source: EE-Oz



Facility Manager

'Facility Manager' is the increasingly common title for those professionals who deal with the efficient operation of facilities, such as buildings, properties and major infrastructure, commonly referred to as the 'built environment'. While specific job titles can vary, responsibilities can range from high-level strategic planning and management to operational and technical issues such as repairs, maintenance, cleaning and security.

In recent years the role of the Facility Manager has developed from an ancillary function toward a dedicated profession seen as central to the successful operation of the built environment (in particular around energy efficiency). This transition is ongoing, with various roles progressively being brought under the 'Facility Manager' umbrella (for example Office Sustainability Manager, Maintenance Coordinator).

The main technologies and resources involved in facility management can be diverse and are always dependant on the type of facility involved and the manner in which it is managed (for example by an individual or contracted services company). Technologies can range from general cleaning equipment to fully-computerised Building Management Systems and any combination or variation in between.

Presently, there are no Federal or State Government requirements for Facility Managers to be registered; however, some basic competencies are typically expected by employers (some technical knowledge, communications skills, etc).

Two levels of professional credentials are available for a Facility Manager through the Facility Management Association of Australia (FMA Australia) in partnership with the International Facility Management Association:

- **Facility Management Professional (FMP)**—Entry level
- **Certified Facility Manager (CFM)**—High level of competency

In the view of the Facility Management Association Australia, with energy efficiency becoming an important business consideration, a medium to long-term skills shortage may develop due to the increasing demand for Facility Managers with high levels of professional competency. However, with low barriers to entry, there is no expectation of a labour shortage during this period.

The challenge is to ensure that the base competency of a Facility Manager in Australia is both sufficient and flexible enough to meet future demands as the sector continues to contribute to the wider economy (for instance, as building reporting requirements become more stringent).

FMA Australia, as the peak national body for the facility management industry, provides numerous avenues for professional development, including industry-developed courses such as its Diploma of Facilities Management offered online throughout Australia by the Holmesglen Institute and the Graduate Certificate in Energy Efficiency for Facility Managers developed in conjunction with AIRAH and other industry partners under the NFEE.

FMA Australia continues to work with industry and government to support existing members and to develop the skills and knowledge of the emerging facility management industry, which was shown in 2007 to contribute over \$13.9 billion to Australia's GDP and employ around 180,000 people.¹⁰⁷ More recently, these figures have been estimated at \$20 billion and in excess of 200,000 full-time equivalent positions,¹⁰⁸ with the industry continuing to grow.

Source: Facility Management Association Australia

¹⁰⁷ Access Economics (2007), *Facility management industry: A statistical profile for 2005-06*, p. i.

¹⁰⁸ IBISWorld 2008.



NatHERS Assessor

The Nationwide House Energy Rating Scheme (NatHERS), which is endorsed by all Australian governments, is designed to encourage improvements in the energy performance of residential buildings through the use of thermal performance assessments.

Through this scheme, trained assessors use one of a range of NatHERS accredited software tools to calculate the theoretical heating and cooling energy load on planned new residential buildings and major extensions to residential buildings. This is done by modeling the effects of heat flow through the building fabric and air movement on internal comfort conditions. It is estimated that in NSW and Victoria combined, over 40,000 residential building thermal performance assessments are conducted annually.

The core work of NatHERS assessors involves using house energy rating software tools, which comply with the NatHERS software accreditation protocol, to assess the predicted thermal performance of planned residential buildings and major extensions on a scale of zero to 10 stars. This involves NatHERS assessors in gathering detailed information on the building shell from building drawings and other specifications at the design stage and using this information to determine the star rating of the building. The star rating is used to inform decisions about whether planned residential buildings comply with the energy efficiency requirements of the Building Code of Australia. NatHERS assessors also provide advice to builders, building designers, architects, householders and others on ways of enhancing the thermal performance of planned residential buildings.

A recent study conducted by the CPSISC, on behalf of the DCCEE, noted that both the scope of work and skill requirements of NatHERS assessors are increasing.

As well as fulfilling their core role of providing thermal performance ratings of new residential buildings and major extensions, NatHERS assessors also provide other building professionals with analysis and options for improving building thermal performance. In addition, some assessors are beginning to use the NatHERS software programs to rate the thermal performance of existing buildings.

At present, training for NatHERS assessors is provided through a State accredited course. This is the Course in Building Thermal Performance (Residential) which was accredited by VETAB in NSW. This course is due for re-accreditation in September 2011.

The recent CPSISC study revealed that the competency requirements of NatHERS assessors are not adequately addressed in the current state accredited course. The study indicated that any new qualification framework should ensure that NatHERS assessors have technical competencies in areas such as: NatHERS assessment, building design, and building plans and specifications as well as generic competencies in areas such as: self management, communication and customer service, risk, safety and security, and information and communications technology. As many NatHERS assessors are small to medium business operators, the study concluded that any new qualification framework should include competencies in small business administration.

Source: Department of Climate Change and Energy Efficiency and Construction and Property Services ISC



(Home) Energy Assessor

For the electrical, refrigeration and air-conditioning trades, the emerging role of Energy Assessor/Auditor in the built environment is defined by an active systems approach to energy efficiency.

The energy assessor role has emerged via state and territory initiatives to implement technologies to reduce energy consumption e.g. replacing incandescent light globes and incentives for solar generation. The role is becoming more sophisticated, aiming at providing cost/benefit analyses of energy reduction strategies and the deployment of selected technologies to reduce and manage energy consumption in commercial/domestic premises.

Assessment and deployment of commercially available technologies which integrate electrical systems with ICT to increase efficiency by managing appliances, lighting and heating in an energy/cost efficient manner are a large part of this approach.

Industry enterprises, industry associations and government recognise the value of this service and are encouraging tradespeople to undertake additional training to ensure a high quality of service.

This broadening of energy assessment services has also changed the role and skill level of the service provider. Electrical, refrigeration and air-conditioning trades qualified personnel with the technical capabilities to provide comprehensive advice and implement systems based solutions are currently in demand and shortages are evident as consumers seek to mitigate energy costs and respond to social imperatives for reduced carbon footprints.

EE-Oz finds that the medium- to long-term picture is less clear and will be impacted by a number of factors which may both change the energy assessor role and the demand for energy assessor services. These include:

- The pace of implementation and take up of new technologies including smart meters, intelligent appliances and the roll out of the NBN.
- New government policy and incentives on renewable, sustainable and energy efficient systems.
- Increased regulatory requirements for energy efficient design in new construction.

Further training for electrical and refrigeration and air-conditioning tradespeople has been included in the UEE07 Electrotechnology Training Package as post-trade skill sets, for example:

- Energy Efficiency Auditor
- Energy Efficiency Systems Designer

These incorporate competencies which cover skills in energy efficiency related work practices, reporting, risk management, specifications writing and equipment evaluation.

Integration of audit/assessment functions with the design and specification of improvements for energy efficiency is emerging as a key role for the electrical and refrigeration and air-conditioning tradesperson. Industry enterprises are developing unique business models around these functions and developing services which include energy use monitoring and financial modelling at the domestic/commercial level.

According to EE-Oz, the advent of smart metering which provides for 'time of use' charging will bring an additional advisory role into the energy assessor function. This will arise because consumers need to be aware of how the changed billing arrangements which accompanying the implementation of this technology can be managed for maximum efficiency for the least cost. Whilst this highlights the advisory role which may be undertaken at the time of installation and later as new level of consumer awareness and engagement drives the consumer to seek to improve efficiency and reduce cost/consumer, it also illustrates the initiation of the cyclic process of improvement.

Skill shortages in this area will be in line with the general demand for electrical and refrigeration and air-conditioning trades skills; however, as demand for these services rise there may be a greater shortage. This may be exacerbated by new government initiatives for energy efficiency, increased demand for tradespeople to work in the resources sector and in projects such as the NBN rollout.

Source: EE-Oz



Appendix E. Recommendations

Recommendation	Responsible organisation
<p>Recommendation 1: Comprehensive workforce development plans be established for occupations related to energy efficiency in the built environment and initiatives coordinated and communicated across jurisdictions and stakeholders</p> <p>It is recommended that under the National Strategy for Energy Efficiency, the Ministerial Council for Energy (MCE) and the Ministerial Council for Tertiary Education and Employment (MCTEE) develop comprehensive workforce planning for occupations related to energy efficiency in the built environment. This will include collecting data on identified occupations, identifying skills shortages and oversupply, and considering how to address shortages in the short, medium and long term, with both VET and the higher education sector to be included. To ensure coordination and communication of workforce development initiatives in energy efficiency across jurisdictions and key stakeholders, the working groups under the National Strategy for Energy Efficiency (the National Framework for Energy Efficiency's Trades and Professional Training and Accreditation Implementation Group, in conjunction with the Green Skills Agreement Implementation Group) should be given the mandate and resources to implement the National Energy Efficiency Skills Initiative.</p>	<p>NFEE Trades and Professional Training and Accreditation Implementation Group, with the Green Skills Agreement Implementation Committee under MCE and MCTEE¹⁰⁹</p>
<p>Recommendation 2: Occupations impacted by energy efficiency be highlighted in Skills Australia's annual skill strategies for specialised occupations</p> <p>It is recommended that Skills Australia prioritises occupations highlighted in this research, such as electricians, plumbers, and refrigeration and air conditioning mechanics, as part of its work in developing consortia of industry and professional bodies to prepare annual skills strategies for specialised occupations.</p>	<p>Skills Australia</p>
<p>Recommendation 3: Industry and the education and training system provide information on career pathways in energy efficiency</p> <p>It is recommended that industry and the education and training sector ensure that information is provided about career pathways in energy efficiency at trade, post-trade, degree and postgraduate level. This should be the responsibility of MCE and MCTEE.</p>	<p>MCE and MCTEE</p>
<p>Recommendation 4: Competitive funding be provided through a regional or cluster-based model to develop VET capacity for energy efficiency</p> <p>It is recommended that MCE and MCTEE make competitive funding available through a regional or cluster-based model to develop VET capacity for energy efficiency skills. This would enable groups of providers to share infrastructure and practitioners to work closely with technical experts, consultants and researchers to expand the curriculum in energy efficiency.¹¹⁰ This should be coordinated under the Green Skills Agreement to up-skill VET practitioners in providing effective training and facilitation in skills for sustainability, including energy efficiency.</p>	<p>MCE and MCTEE</p>
<p>Recommendation 5: The development of courses in energy efficiency at all levels be included under outcomes-based funding for universities</p> <p>It is recommended that outcomes-based funding for universities include the development of programs and electives in energy efficiency at undergraduate and postgraduate level, including PhD scholarships in topics related to energy efficiency, for example the thermal performance of buildings.</p>	<p>MCTEE</p>
<p>Recommendation 6: Training in developing a business case for energy efficiency be incorporated into relevant tertiary courses</p> <p>It is recommended that MCE and MCTEE encourage courses at VET and higher education level to incorporate training in the development of a business case for energy efficiency at all levels, informed by examination of comparable courses in North American universities and colleges.</p>	<p>MCE and MCTEE</p>

¹⁰⁹ See note 8.

¹¹⁰ See note 9.



Appendix F. List of acronyms

ABGR	Australian Building Greenhouse Rating
ABS	Australian Bureau of Statistics
AIRAH	Australian Institute of Refrigeration Air Conditioning and Heating
ANZSCO	Australian and New Zealand Standard Classification of Occupations
AQF	Australian Qualifications Framework
ARIES	The Australian Research Institute for Environment and Sustainability
BCA	Building Code of Australia
CEPU	Communications Electrical Plumbing Union
CFM	Certified Facility Manager
COAG	Council of Australian Governments
CPD	Continuing Professional Development
CPSISC	Construction & Property Services Industry Skills Council
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCCEE	Department of Climate Change and Energy Efficiency
DEEWR	Department of Education, Employment and Workplace Relations
DEWHA	Department of Environment, Water, Heritage and the Arts - Now Department of Sustainability, Environment, Water, Population and Communities
DEC	(NSW) Department of Education and Communities
DIISR	Department of Innovation, Industry, Science and Research
DLP	Defects Liability Period
EBPPP	Enterprise Based Productivity Places Program
ESCO	Energy Service Company
EEGO	Energy Efficiency in Government Operations
EEO	Energy Efficiency Opportunities Program
EE-Oz	ElectroComms and Energy Utilities Industry Skills Council
EER	Energy Efficiency Rating
EU	European Union
FMA	Facility Managers Australia
FMP	Facility Management Professional
GBCA	Green Building Council of Australia
GLS	Green Lease Schedule
GSA	Green Skills Agreement
HE	Higher Education
HESS	High Efficiency Systems Strategy
HVAC	Heating, Ventilation and Air Conditioning
ISC	Industry Skills Council
LED	Light Emitting Diode
LEHR	'Low Energy High Rise' Building Research Study
LTTS	Long Term Training Strategy for the Development of Energy Efficiency Assessment Skills
MCE	Ministerial Council for Energy
MCTEE	Ministerial Council for Tertiary Education and Employment
NABERS	The National Australian Built Environment Rating System
NatHERS	Nationwide House Energy Rating Scheme
NBN	National Broadband Network



NEESI	National Energy Efficiency Skills Initiative
NFEE	National Framework on Energy Efficiency
NGER	The National Greenhouse and Energy Reporting Act
NSEE	National Strategy on Energy Efficiency
NSNL	National Skills Needs List
OHS	Occupational Health and Safety
PJ	Petajoules
QEEILG	Queensland Energy Efficiency Industry Leaders Group
RBMD	Residential Building Mandatory Disclosure
RTO	Registered Training Organisation
SOL	Skilled Occupations List
SpOL	Specialised Occupations List
TAFE	Tertiary and Further Education
VET	Vocational Education and Training
VETAB	Vocational Education and Training Accreditation Board



